THE Agricultural Journal

OF THE

CAPE OF GOOD HOPE.

VOLUME XXXV.

JULY—DECEMBER, 1909.

Published by the

Department of Agriculture,

CAPE OF GOOD HOPE.

Cape Town:

CAPE TIMES LIMITED, GOVERNMENT PRINTERS.

The AGRICULTURAL JOURNAL, VOL. XXXV.

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THE

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Published Monthly in English and Dutch by the Department of Agriculture and distributed gratis to bona fide farmers in the Cape Colony on application through the Resident Magistrate of the District.

SUBSCRIPTION 5s. PER ANNUM. Post Free in South Africa.
Remittances to be made Payable to the Publishers CAPE TIMES, LTD., Church St., Cape Town.

Advertising.—Approved Advertisements are inserted. Full particulars can be obtained from the Sole Advertising Contractors, THE CENTRAL NEWS AGENCY, LTD., 125-127, Long Street, Cape Town—P.O. Box 9—Telephone No. 438—Telegraphic Address: "Periodicals"—to whom also all accounts must be paid.

Postal Address:
The Editor "Agricultural Journal," Department of Agriculture, Cape Town.
Telegraphic Address: "Bulletin," Cape Town.

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NOTES.

Cattle Dipping Tanks.—Grants in Aid.

From and after the 30th June, 1909, no further grants in aid of the construction of Cattle Dipping Tanks will be made by the Government under the conditions set forth in Government Notice No. 1069 of 1908, which has been cancelled and withdrawn from and after that date. In lieu thereof it is proposed to make advances in aid from public funds towards the construction of approved tanks, which advances are to be repaid within a period of years. Regulations setting forth the conditions under which such advances will be made will be published hereafter.

To Correspondents.

It has again become necessary to call attention to the rule that all correspondence addressed to the Editor must be accompanied by the writer's name and postal address, in addition to any pen name which may be desired to be used for publication. By far the larger number of letters received are enquiries for information on general farming questions of a very simple nature or such as has been previously published. It is quite obvious that in these cases the information sought can be forwarded direct, and there is no necessity for publication. But when names and postal addresses are omitted this course is rendered impossible, and as the publication of such communications is out of the question, they remain unanswered. This explanation must suffice for a good many letters which it has been found impossible to deal with lately. We are only too anxious to supply information, and constantly invite correspondence. The only condition attached to this offer is that enquiries shall be accompanied, *in all cases*, with the correspondent's name and full postal address of the writer.

"South African Bee-Keeping."

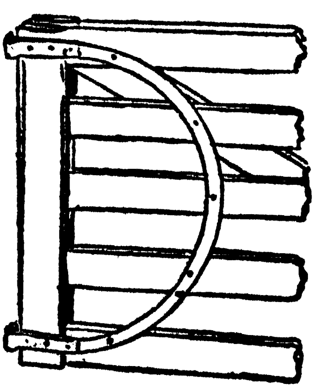
The above is the title of a new book just issued by the Department of Agriculture, Cape Colony. This work comprises the articles recently contributed by Mr. H. L. Attridge to the *Agricultural Journal*, and are now published with a copious index as "a complete guide to the practical management of S. A. Bees in movable comb hives." The book is cloth bound and well illustrated, and should be in the hands of all S. A. bee-keepers; and those commencing this pursuit. The author is well known throughout South Africa as an expert, lecturer, and practical apiculturist. By way of introduction the early chapters of the book are devoted to such subjects as the early history and progress of apiculture, its educational aspect, and as recreation for mind and body. The commercial side of bee-keeping is also touched upon. After dealing with the natural history of the honey

bee the author describes the different races of bees, enumerating the good and bad points of some of the best known varieties. The South African bee is fully discussed, and certain recommendations are given to guide the beginner in selecting the most suitable kind for cultivation. The anatomy and physiology of the honey bee forms an interesting chapter. The practical management of bees is very lucidly explained, several original illustrations being introduced to assist the beginner and less advanced apiarist. Various patterns of hives and appliances suitable for S.A. conditions are illustrated and explained. There are chapters on the following subjects: Location of Apiary. Subduing and handling bees. Driving and transferring. Swarming. After swarms. Artificial swarms. Prevention of swarming. Uniting bees of different colonies. Modern methods of queen rearing. Feeding bees. Introducing queens. Robbing by bees and diseases of bees, etc. All the methods advocated are given by the author as the outcome of several years experience and close study of bee life. The work is now on sale at the leading booksellers, and can also be obtained on application to the Government Stationery Department. It is also obtainable in Dutch.

Wooden Fencing Droppers.

The Forest Department notifies in this issue that wooden fencing droppers are delivered at the following railway stations:—In the Eastern Province: Greytown platform, Toise River; in the Western Province: Retreat Station, Maitland Station, and Ceres Road. Full particulars in advertisement.

Combined Gate Hinge and Brace.



The combined gate hinge and brace shown in the accompanying illustration (taken from an Australian Exchange) introduces a new and effective principle. The hinge and brace is made from an old wagon tyre, the ends being worked into hinges after the proper bend has been given to the tyre. Holes are bored at suitable distances. The fact that the hinge and connecting brace are one piece of iron aids materially in preventing the gate from sagging.

Almeria Grapes.

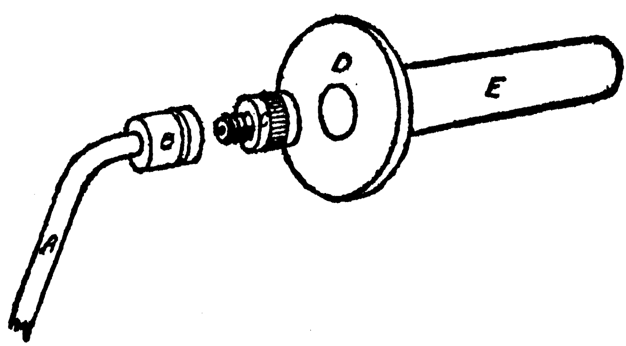
The Trades Commissioner in London forwards the following information:—I can now supply you with the following new figures. These are made up from the actual experience of a box of Almeria grapes which arrived from Australia. These grapes were sold one week at 18s. per box, and the next at 24s. per box (net weight of grapes 27 to 28 lbs.):—Size of box, 25 x 15 x 8½″; net weight of wood in box, 10 lbs.; net weight of grapes, 27 to 28 lbs.; net weight of cork dust, 4½ lbs.; freight at 25s. per ton, 1s. 3d. Estimated cost (highest) of box at the Cape, 9d.; of cork dust in Cape Town, 5d.; of freight at 25s. per 40 cubic feet, 1s. 3d.; of labour for packing, 3d.; of railage and Dock dues, 9d.; London charges about 10 per cent. on 11s. 6d. per box, 1s. 2d.; total, 4s. 7d. If the grapes can be sold at from 4d. to 7d. per lb. it would leave a handsome profit to the grower. These are much lower prices than what the Australian grapes have fetched.

Sale of Cape Produce in the Transvaal.

The attention of farmers and producers generally in the Cape Colony is directed to the terms of Government Notice No. 636, dated the 3rd June, 1909, again intimating the fact that Mr. Alfred Webb has been appointed as Government Agent in the Transvaal for the sale of Cape farm produce. As a guarantee against bad debts, and for the due fulfilment of all obligations, the Agent has deposited with the Treasurer of the Colony securities amounting to £3,000, which can be realised in the event of failure on the part of the Agent to duly discharge all sums due for farm and other produce consigned to him. The full conditions of the scheme, as also any further information that may be required, can be obtained by communicating with the Under Secretary for Agriculture, Cape Town. The Agent's address is as follows:—Mr. Alfred Webb, 1, Parker's Buildings, Market-street, Johannesburg (or P.O. Box 2342, Johannesburg). Telegraphic Address: "Co-operation," Johannesburg.

Artificial Calf Feeder.

Herewith is a sketch of a calf feeder (patented), invented by a dairyman at Albury, Australia, who has had considerable experience in calf-rearing, the feeder in question being the outcome. It shows many valuable points in its favour, one in particular, the brass bulb on the end of the suction pipe, which goes inside the rubber teat. This bulb is removable,



Pipe, screwed into B. B—Socket into which C screws. C—Bulg which screws into B, with hole bored through its centre, same size as in end of E. D—Flange on E, to prevent it being pulled through hole in fence. E—Mouthpiece of rubber teat.

and has a hole bored through it, corresponding with the hole in the end of rubber teat, but being made of metal it never wears, and regulates the flow of the milk, irrespective of the condition of the rubber teat. It is claimed by the inventor (Mr. E. Turnbull) that the same good results will be obtained as long as there is rubber teat enough for the calves to catch hold of to suck as when it is brand new. This point means an enormous saving in teats. Another point is that the calves do not scour with these feeders, and the greatest advantage is that a saving of close on 8 galls. of milk per day on every 25 calves is secured. This is a valuable point to all concerned, and together with the stiff suction pipe, which stands rough usage, and is practically everlasting, goes to make an ideal calf feeder.—*Australasian.*

Wine Vinegar—The Addition of Brandy or Spirit.

Representations have recently been made to this Department to the effect that much of the wine sold for the purpose of vinegar-making is of so low an alcoholic strength that when made into vinegar the acetous strength is deficient, not attaining the standard prescribed by Act No. 19 of 1908. In case any misapprehension should exist in regard to this matter, it is now stated for general information that it is permissible to add pure wine brandy or wine spirit or spirit distilled in terms of Section 7 of Act No. 42 of 1906, to such wine prior to its manufacture into vinegar, provided all the conditions prescribed in the Section quoted are strictly complied with. The vinegar prepared therefrom may be labelled "Vinegar," or "Wine Vinegar," in terms of Act No. 19 of 1908.

Export of Citrus Fruits.—Inspection at Ports.

The Government has arranged to carry out at the Cape Town Docks and Algoa Bay a system of Inspection of Citrus Fruit intended for export in acordance with the provisions set forth below. The inspection is being conducted personally by inspectors appointed by the Department, and these officers will furnish full reports for the use of shippers. Exporters may be present at the inspection of their fruit, or may send representatives.

1. Each intending Exporter of Citrus Fruit who wishes to avail himself of inspection by the Government Officer at the Cape Town Docks or at Algoa Bay, of all such fruit as he proposes to export, must previously complete the necessary form of Agreement with the Department of Agriculture, and forward this document to the Under Secretary for Agriculture, Cape Town, accepting these conditions, stating at the same time the distinctive mark which he will place on his fruit boxes; any withdrawal from this undertaking will require a week's notice. He will be informed in due course that his name and address and distinctive mark have been registered and his fruit will be accepted, from and after a stipulated date, by the Inspector for examination prior to shipment. Forms of Agreement to be signed by intending shippers of fruit, may be obtained on application to the Department of Agriculture, or from Mr. More, Superintendent of the Port Elizabeth-Avontuur Railway, Port Elizabeth.

2. Every box of fruit considered by the Inspector as suitable for export will be branded by him with the Cape of Good Hope Coat-of-Arms, encircled by the words "Passed by Government Inspector," and for each consignment examined by him a charge at the rate of ¼d. per box of one layer, and ½d. per box of more than one layer, will be made to the exporter.

3. The disposal of boxes of fruit not passed by the Inspector in terms of Condition 7, and for that reason not to be exported, must be arranged by the exporter with local agents in Cape Town or Algoa Bay, as the case may be. Fruit not passed by the Inspector can in no circumstances be shipped.

4. Every registered exporter must make his own arrangements for the disposal of his fruit in Europe.

5. Every box of fruit submitted for inspection must be:—

(a) Clearly marked, *on one end thereof*, with the registered mark of the exporter, or his name or other means of identification, and the variety (if possible), and the number of fruits contained therein.

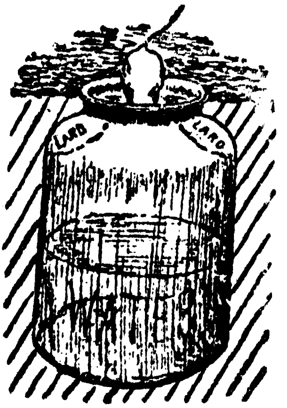
(*b*) Consigned to the Dock Traffic Manager, Cape Town, or local Agents at Algoa Bay, and also bear the address of the agent appointed by him for disposal of his fruit in Europe.

6. All fruit *must* be wrapped in tissue paper.

7. All fruit must be of first rate quality, free from all blemishes affecting the appearance of the fruit, evenly graded and uniform in size, of the characteristic shape of its variety; and only one variety of fruit must be packed in a single box. Any box containing fruit which fails in any of these requirements will not receive the Government Brand.

8. All fruit must arrive at the Cape Town Docks not later than Tuesday morning to permit of shipment by the steamer sailing on the following Wednesday; and, in the case of Algoa Bay, not later than Friday morning.

Mouse Traps for the Garden.



Traps of the following description—earthenware or glass jars, each with a good shoulder, as in the sketch—should be sunk in the ground so that the tops become level with the surface. While the jars are dry, fix some pieces of lard or dripping inside, close up underneath the shoulders, then half fill the jars with water. The mice, in attempting to reach the lard, fall in and get drowned. These traps require very little attention, and can remain set without danger to other animals. Remove the dead mice as often as necessary. —*Observer*, Adelaide, South Australia.

Insects in Grain.

A correspondent asks how best to prevent insects from attacking stored grain. In reply the Government Entomologist says:—The use of Carbon bisulphide is the best chemical treatment for insects in grain. In brief, this substance is a heavy fluid which volatilizes, on exposure, to an inflammable, life-destroying gas considerably heavier than air. For the destruction of grain insects, one pound is used to about 40 bushels of the grain to be treated. This is sprinkled over the grain or the sacks that contain it, exposed in shallow dishes on top, or distributed on absorbents. Obviously the less the gas can escape from the receptacle in which the grain is enclosed, the better the chance of success. Less attention is necessary for the top than the bottom, owing to the fact that the gas naturally sinks. The exposure should be for a couple of days. Anything which might ignite the gas, even lighted pipes, should be kept at a distance until the fumes have disappeared, or a disastrous explosion might result. In small quantities this chemical can be bought for about 2s. per pound.

Molteno Cattle Sickness and Senecio Latifolius.

In 1906 the Veterinary Branch conducted a series of feeding experiments in connection with a serious and continued outbreak of disease among cattle at Molteno, which came to be known as Molteno Cattle Sickness. These experiments proved conclusively that the disease in question —really cirrhosis of the liver—was traceable to a weed of the ragwort

variety—*Senecio latifolius*. Since then, in connection with these outbreaks, specimens of the plant were sent for chemical investigation to the Scientific and Technical Department of the Imperial Institute. We now learn that from the specimens forwarderd two new crystalline alkaloids have been isolated. The quantity of these substance present amounts to 1·20 per cent. in the plant before flowering and to 0·49 per cent. in the plant "after flowering." A description of the properties and chemical composition of these alkaloids has been communicated by Dr. H. E. Watt, of the Scientific and Technical Department of the Imperial Institute, to the Chemical Society of London. The two alkaloids, for which the names senecifoline and senecifolidine are proposed, are of particular interest in being obtained from a plant belonging to the N. O. Compositæ—an order containing very few species yielding substances of an alkaloidal character. The formulæ $C_{18}H_{27}O_8N$ and $C_{18}H_{25}O_7N$ have been assigned to senecifoline and senecifolidine respectively, so that they differ in composition by a molecule of water. A number of the principal salts of both alkaloids have been prepared. Senecifoline on treatment with alkalis decomposes, yielding a new dibasic acid of the formula $C_{10}H_{10}O_6$, which it is proposed to name senecifolic acid, and a new base $C_8H_{11}O_2N$, for which the name senecifolinine is suggested. Hence it appears that this alkaloid decomposes in a manner analogous to atropine, which, when treated with barium hydroxide, decomposes into atropic acid and tropine. The pharmacology of senecifoline and senecifolidine is being studied by Professor A. R. Cushny, F.R.S., who has already found that the former is poisonous to animals.

Young Pig Management.

A hog is half made when past the weaning period without a stunt or kink in its growth. Every check or halt in prosperity through its first two months is more expensive than at any later period. Too much rich, feverish milk of the dam, causing thumps or other ailment, may leave harmful results, perhaps as much so as scant feeding or other neglect of the sow. More injury may be done to a pig's growth in two or three days than can be repaired in a month, even if he is made the subject of special care, which where many are raised is not the rule nor easily practicable. "Good luck" with pigs calls for attention, and that not occasional, but frequent and regular. From the first week after farrowing until weaning time, the sow will be little else than a milk machine, and to be a high-power machine in perfect operation she must have proper care. Nothing else is so well calculated to make pigs grow as a bountiful supply of wholesome sow's milk, and the pigs that have plenty of other feed with the milk of a well-slopped sow for eight weeks will ordinarily have much the start of those weaned at five or six weeks, no matter how much food and attention the earlier weaned pigs may have had. At eight or nine weeks old most pigs are, or rather should be, fit to take away from the sow; some litters are individually older at seven weeks than others at ten, and better fitted for weaning. Sometimes it is necessary to wean when the pigs are five or six weeks old, and in other cases it may be advisab'e to wait until the pigs are ten weeks or even older. Breeders who wean at early ages generally do so in order to more profitably raise two litters a year.

Provided with and taught to eat suitable feeds some weeks beforehand, pigs are not noticeably checked in their growth by weaning, but those that have been dependent mainly upon the mother's milk, when abruptly taken away from it, frequently seem to have their growth partially suspended for weeks. Many breeders successfully let the sow wean

her pigs, as she will in time, and the change is so gradual that no pause in growth indicates when the milk diet ceased. A modified application of this, in which the pigs are separated from the sow at an age suiting their feeding and the convenience of the breeder, will not infrequently be found advisable, but by no means should the pigs be allowed to remain with a sow until she is virtually devoured by them as is sometimes done. It is not a good plan to take all the pigs from the sow, unless one or two of them can be turned with her some hours after, to draw the milk she will have at that time, and again, say after a lapse of 24 hours. The preferred way is to leave about two of the smallest with her for several days, and after that leave only one for two or three days more, by which time the flow of milk will have been so gradually diminished that no injury to the sow will result by keeping them entirely away from her. This extra supply of milk helps also to push the smaller pigs along in growth and put them more nearly on an equality in size with their thriftier mates.—From Coburn's "Swine in America."

Fastening for Codlin Moth Bandages.

The *Agricultural Gazette*, of New South Wales, publishes the following: "While in the Tangmangaroo District, Inspector Johnston was shown a very handy fastener for securing to apple, pear and quince trees the bandages for catching the grub of the Codlin Moth. This handy little

Fig. 1.—The Fastener.

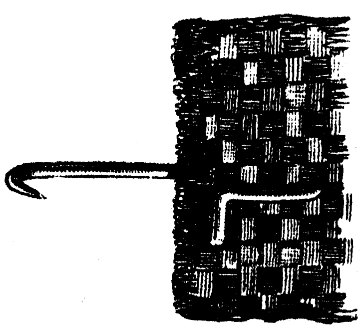


Fig. 2.—The clip in position.

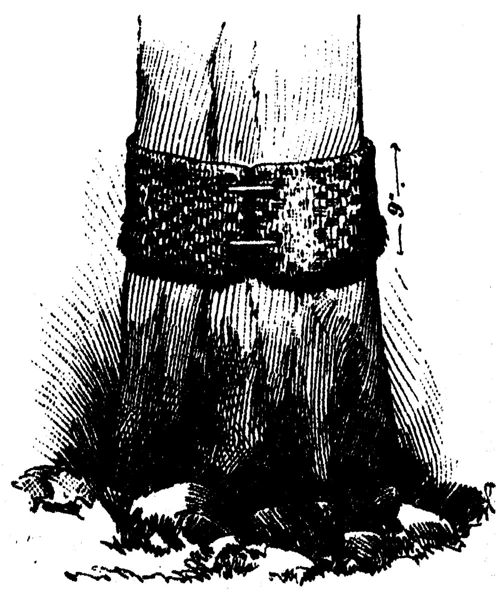
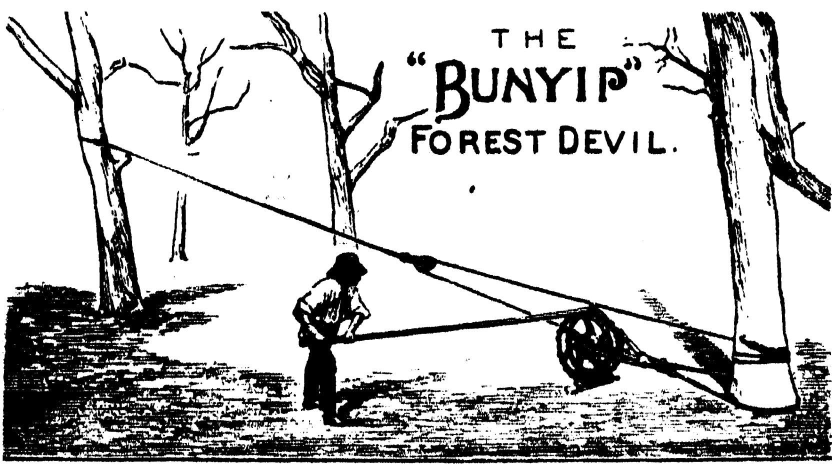


Fig. 3.—A Codlin Moth Bandage secured by means of Mr. Boulding's invention.

piece of bent wire was invented by Mr. J. Boulding, who is using it in preference to nails, strings, etc. It is easily made, lasts well, cannot readily be lost, and is easily attached to the bandage. It is one of the best fasteners I have seen, and, when it becomes known, I feel sure the fruit-growers will use it largely. These fasteners can be made during the long winter nights, so that they will be in readiness for use when the season for bandaging the trees comes round again.

The "Bunyip" Forest Devil.

Correspondents in the Eastern Province have often asked to be kept informed as to any new appliances which may come on the market calculated to be of use in the eradication of the indigenous thorn trees known as mimosas, which are so difficult to remove or keep in check once they become well established. The illustration herewith (taken from "Australian Farm and Home") shows an appliance put on the market by Messrs. John Cooper and Sons, Elizabeth-street, Melbourne, which seems worth a trial. It is stated to make short work of the toughest of trees and stumps. It is described as being very simple in construction and easy to work. Efficiency, great strength and portability are its leading features. It consists mainly of a wrought iron frame, between the two perpendiculars of which is placed the drum and two wheels, notched deeply on the edges, so that they may be used with proper levers for



winding the steel rope utilised in hauling down trees and uprooting stumps. When getting to work a length of the steel rope is run out from the machine and attached to a tree or stump in order to provide the necessary purchase. A longer length of the rope is then taken out ahead, the further end of which is lashed at the required height around the tree or stump that has to be uprooted. The man in charge then attaches the lever to the centre of the machine over the drum and proceeds to work his lever by hand. The lever is double-purchase in its action, that is to say, the notches or cogs on the edge of this wheel alternate, so that the lever is operative in both push and return. The wire rope first run is taut from the start. With each stroke of the lever the slack of the forward rope is lessened. When tightened, the gradually increasing strain on the tree or stump, as the case may be, soon causes a yielding to the great hauling power brought to bear by the lever and drum. The most stubborn tree or stump is speedily torn out by the roots. It weighs 4½ cwt., and is portable, a boy being able to run it about on its own wheels to any part of a paddock. Any of our readers desiring further information should write to the Australian agents, Messrs. John Cooper and Sons, Elizabeth Street, Melbourne.

Standard Cyclopaedia of Agriculture.

The fourth volume of the "Standard Cyclopaedia of Modern Agriculture and Rural Economy," mentioned last month, has been submitted to us by the local publishers, Messrs. D. E. McConnell and Co. It is quite equal in every respect to the first three volumes. Full particulars may be seen in the advertisement in the business pages.

Eel Worm in Potatoes.

Mr. Alfred Webb, the Produce Agent representing the Cape Colony, in Johannesburg, wrote recently pointing out that a large number of consignments of potatoes from this Colony have been condemned there lately through being affected with eel worms. All consignments affected with five per cent. and over are returned. It is evident, Mr. Webb continues, that this disease will increase if repressive measures are not taken, and urges that the position should be made widely known, otherwise the lucrative Transvaal markets will be closed to Colonial producers. Sound, healthy potatoes were worth at the time of writing (June 8th) from 17s. to 20s. per bag at Johannesburg, and he would like to see Cape farmers participating in these good returns, but this can only be done by planting sound seed in clean soil. The time is rapidly approaching when the careful farmer will score heavily over his negligent competitors in all branches of the business, and he trusts that by united efforts the Cape will maintain her position in the van of agricultural progress, as hitherto.

Œnological Instruments of Precision.

J. Dujardin, successor of Salleron, of 24, Rue Puvèe, Paris, has published an English abridgment of the French notes on the "Œnological Instruments of Precision," originally brought out to popularise Œnological Chemistry, and its general application to vinification or the testing of musts. A copy of this is to hand, and should be in the hands of all progressive viticulturists. It deals very clearly with every phase of the subject, showing all the instruments necessary for use in the various testing processes. These are in the form of a catalogue with prices attached. The original work, published in French, has been well received and highly spoken of by the technical press of that country, where viticulture forms so important a part of the national industry.

DRY LAND FARMING, WATER STORAGE AND IRRIGATION IN AMERICA, COMPARED WITH SOUTH AFRICAN CONDITIONS.

By O. A. Oosthuisen, M.L.A., South African Delegate to the National Irrigation Congress at Albuquerqu, New Mexico, U.S.A., Sept. 19th, 1908.

The following paper embodying experiences in the United States and other countries was read by Mr. Oosthuisen at the South African Irrigation Congress, held at Robertson, C.C., in May last:—

I may state that my reasons for visiting the semi-arid parts of the States, as also India and Egypt—although my time was very limited—were with the object of investigating from a South African farmer's point of view, the subject of water storage, and Irrigation.

In America, where the rate of wages for labour is on a par with ours, and in some respects even higher; where the farmer is an European, with a scale of living very much like ours in the Colony; it was reasonable to anticipate that labour-saving machinery or other advantages must play an important part in the carrying out of works of that nature to make them a financial success. On the other hand in India and Egypt, labour is cheap, and the farming is done by the native Ryot and Fellahin, respectively. On arriving in England I proceeded almost directly to the United States with the object of inspecting some of the irrigation projects during the time at my disposal, and to obtain that end I visited the Government Departments at Washington, D.C., and to the officials there I am indebted for enabling me to inspect some of the schemes under construction, and some completed. I formulated my programme to enter the drier region of the States from the North-west and work South-west, ultimately leaving by the Pacific coast. To realise that object I proceeded to the State of North Dakota, to get, as it were, a glimpse of the wheat-growing interests, touching at Fargo, the capital of that State; here a Conference on Dry Land Farming had its sessions, at which I could attend for only one day.

Dry Land Farming.

There are several Experimental Stations in Dry Land Farming in the Western States. Although the oldest kind of farming, it forms a new branch of the Agricultural Department, and may be said to be only in its initial stages here. It is a product of the pressure caused by the increase of population. It is also meant to prevent indiscriminate "Homesteading" in sections where the rainfall is insufficient to cultivate by the well-defined methods of the Eastern part of that country. These stations may be divided into two classes: those conducting experiments exclusively by natural precipitation, and those combining the office of discovering the relative yield between crops irrigated with minimum and maximum

waterings. The situations of these stations are fairly average of the surrounding country. The altitude of those visited was between three and six thousand feet above the sea level; rainfall from 12 to 15 inches per annum. Nature of the soil a soft mould of a sandy nature, very absorbent, with a grade that would allow of very little run off. In its virgin state the soil is covered with short grass, which lends itself to being broken up with an ordinary plough and team of four horses. The experiments are conducted with cereals and root crops; last year the yield was exceptionally good.

Methods Adopted and System Recommended for Dry Land Farming.

These consist in holding two years moisture for one crop. In other words, that you get a harvest off the same land every other year. To do this the farmer divides his land into two portions, one half being under crops, and the other half being summer fallowed.

Ploughing.—The ploughing must be deep, eight or nine inches, and should be done in the autumn.

Harrowing.—All ploughing should be thoroughly harrowed the same day it is ploughed, or else there is a loss of moisture (and drill as well) diagonally or at right angles to the way in which the prevailing winds blow. This is to prevent the particles of soil from injuring the young grain by being carried along the drill furrows by the wind; harrowing must be done after every heavy rain. This must not be deferred too long, because if the surface of the soil gets too dry, it is more liable to drift when cultivated. The farmer must use his own judgment.

Maintaining the Soil Mulch.—This is one of the most important factors in Dry Farming to prevent the forming of a crust, to allow the proper action of the sun and air, to break up the capillaries, and prevent the moisture rising to the surface and evaporating, and intercept the growth of weeds.

Sowing the Crops.—This should be done early in Autumn. Sowing should be thin, thirty to forty pounds to the acre for wheat. What is of vital importance is that the seeds should be properly planted. Broadcast sowing, either by hand or machine, is condemned. The Press Drill is the essential implement for Dry Land Farming, it puts the grain in in a proper shape, and to the right depth, pressing the soil around the seed, which insures moisture to cause it to germinate.

Seed to Use.—Only the very best obtainable should be used. If possible use seed grown without irrigation.

Cultivation.—Under this system a soil mulch must be maintained not only on the fallow lands, but also on the lands which are raising the crop. In the Spring thoroughly harrow your grain; to do this properly requires a sharp harrow. Do not be afraid of harrowing out too much grain.

Mixed Farming.—The best paying Dry-Farm is where the crops are fed to the stock. The manure is an important item to be added to arid soils, as it increases their humus, making them more retentive of moisture, as well as richer in plant food.

Equipment Needed.—The Press Drill is one of the essentials, either of the shoe or disc type. In heavy clay soils a double press wheel should be used, as it leaves a crack or opening directly over the seed through which the germinating plantlets can push their way out of the ground. A good Gang plough is also needed, an Acme harrow, and one or two good cultivators. The above is for a rainfall of less than 15 inches per annum.

There is no doubt a great deal in these recommendations, which may with advantage be applied in those portions of this Colony where the soil is light; that is of a loose nature, porous and fairly level. As to the system of deep ploughing and cultivation to retain two years' moisture for

one crop, it is certainly worthy of trial. Deep ploughing in our ordinary heavy Karoo soils in a dry or even in a damp state is an expensive item, as it requires the best of ploughs and teams. And to establish the soil for dry land farming it would require to be ploughed quite twelve inches deep to make it as sufficiently retentive of moisture as these American soils with shallower cultivation. This ploughing can be accomplished by them in a very ordinary way; but with us only the very best of implements would have to be employed. The plough would have to be of the contractor type, and the team would have to be exceptionally strong; but that is no reason why on stock farms it should not be tried, where feed locally grown is of double value to the farmer in time of drought.

In comparing the nature of things in those parts of the States with ours, apart from deficiencies in inches of rainfall, temperature, evaporation, etc., I may say that the following features militate against us.

The grade of our land in the Cape Colony, with few exceptions, is too high. Our soil is not retentive enough, and too large a percentage of our rainfall is lost on account of the drain. In close connection with that is the imperviousness of our subsoil, with the exception of alluvial pockets; it is much too firm and shallow, to absorb such rains as may fall out of season, which is the medium of producing germination of the seed at the sowing time; hence the reason of our having to inundate our lands before sowing.

The Irrigation experiments in connection with these stations have not obtained sufficient data to go by, an exceptional rainfall nullifying the whole year's observation; but it is generally admitted that with one irrigation at the critical period, the result is doubled. The watering is conducted by means of four-inch galvanised sheet iron piping, the sections fitting into one another. The line is continued to the lowest portion of the land to be watered; as soon as that is wet a few sections of piping is removed to allow the water to escape higher up. This method is resorted to to avoid the open furrows which absorb too much water, in a porous soil. It is certainly an advantage in small waterings from windmill pumps.

The Reclamation Service.

Before entering into the subject of irrigation projects visited by me, I wish to mention that the Department which constructs these works for the State is styled the Reclamation Service. Its origin and creation by the State may be attributed largely to the deliberations and suggestions of the National Irrigation Congress. It was established in 1902, and its funds are at present those derived from the sale of Government Lands in certain States and Territories, in the West; its scope is such as to authorise it to survey and construct irrigation works for the storage, diversion and development of waters including artesian wells.

There will be no cause for surprise when I state that very few of the larger projects have been completed during its short existence. It is obvious that in the first instance all the inexpensive and most promising schemes were executed either by individuals or companies, leaving the more costly and extensive projects to be dealt with by the State.

My investigations may be placed under three types. First, the Storage project entirely dependent on rainfall, the supply of which is uncertain. Its construction may be earth, concrete, or earth with concrete core. Secondly, the river or canal work with an insufficient supply at a certain time of the year which is to be supplemented by storage. These structures may be of the above type, either on the alignment of the canal, or in the river higher up. Thirdly, the perennial river work or canal entirely independent of storage, but having a continuous and unfailing supply.

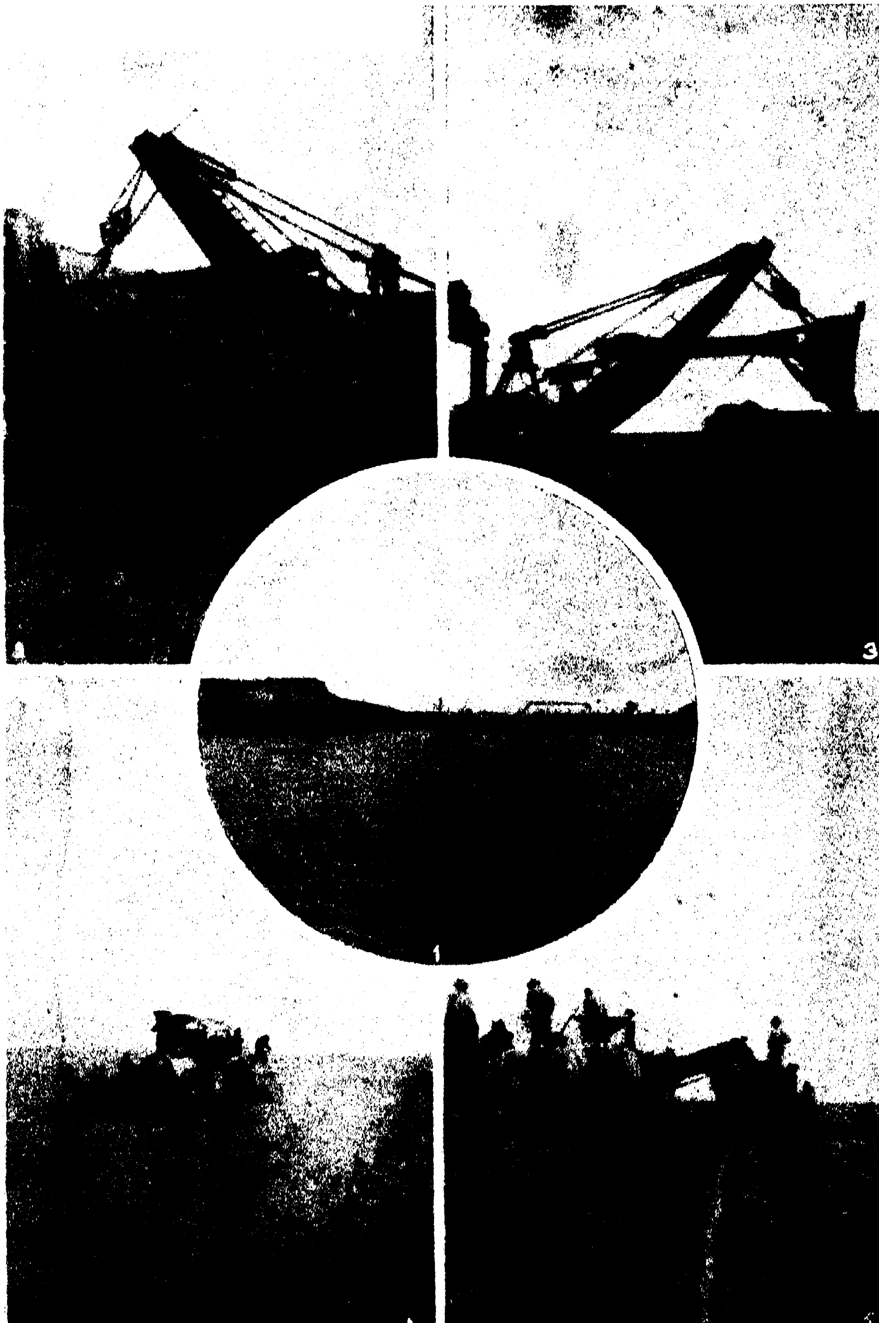
It is only natural that in a country of great possibilities, which is only entering into the first serious stage of developing irrigation, and with a Department like the Reclamation Service, they wish to show results, and will not venture on a doubtful scheme of storage dependent for its success on a precarious rainfall. I was therefore denied the privilege of comparing an American dam with a typical South African farmer's structure of that nature.

The nearest approach I reached was one known as the Hondo Project, completed, in New Mexico State. Its features departed from our storage sites in these respects: first, the bank was not built across the dry river bed; second, the whole supply to fill the dam was brought in by a canal when the river flooded. Therefore the supply is under control to a certain extent. The intake of the water is regulated by having a concrete wall at the end of the canal in which there are a number of gates, by which the water line can be lifted by putting flash-boards into these, allowing only a percentage of water into the dam if necessary. On the opposite side in the canal bank are big spill gates to take off large quantities of silt back into the river when there is water to spare to scour with; if, however, all the water is to be utilised to fill the reservoir the scouring process will have no chance.

The reservoir is situated in a natural depression, something like one of our "pans," only they had to build six banks, from 6 feet to 25 feet high on the depressions of the hills, all of earth with riprap of stone to prevent the action of the water. The advantage they have is they can draw the water off, out of the dam, back into the river by making a 14 feet deep canal. At the time of my visit there was no supply available for irrigation. Principal data: The dam covers 1,910 acres; capacity 40,000 acre feet; irrigable area, 10,000 acres; water shed 1,037 square miles; average rainfall 18 inches; value of irrigated land £17 to £30 an acre. In justice to this project I must say that it is not long enough in action to judge of its success or otherwise.

The River or Canal Project with Storage.

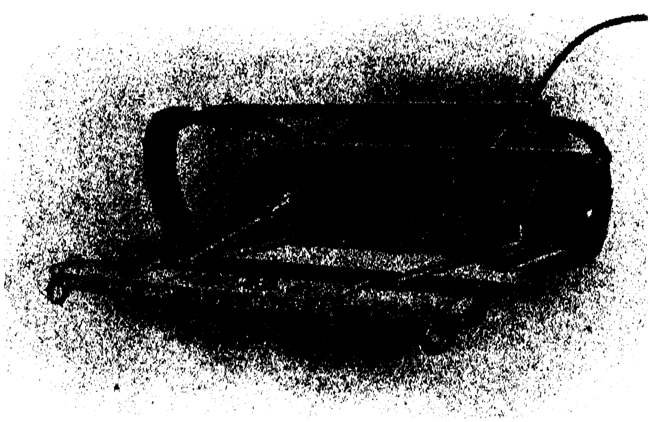
Of this I selected one where the dam was in course of construction of the earthen bank type. The wall is claimed to be the highest bank of that nature, namely 115 feet, and to hold up water to the height of 100 feet, at full supply. The bank is 63 feet thick; at the base 500 feet. Its length is 6,400 feet, and the water surface is between 13 and 14 square miles. It has a catchment area of 170 square miles, but the run off from that is only looked upon as sufficient for evaporation and seepage. The supply is to be derived from the river by means of a forty-feet wide canal, the head works of which are entirely completed, and consist of a forty-feet high weir of reinforced concrete 35 feet thick at the base, and 7 feet on top, length 400 feet; it holds up 23 feet of water with a backwash of 3 miles. At a glance the abnormally great height of the weir will be noticed, and the reasons are not far to seek, for the ground and banks are sloping, and approach in some respects the difficulties to contend with in our own rivers. Another reason is the canals alignment had to be such as to enter the catchment area of the dam, which it does at the 6½ mile. There will naturally be no complications with silt and sediment, as the draw-off is so very high from the bottom of the weir, and the backwash of the water up the river will very materially mitigate these troubles. The main canal and the distributing canals form quite an expensive item on this project, as some very difficult ground had to be negotiated in the form of passing under the main river and other streams, and in getting through some high ground and deep creeks. The principle adopted was tunneling, and concrete lining in the latter, and in the former by inverted syphons also reinforced by steel bars of ½ to ⅝ inch; these are surrounded by 6 or 8 inches



1. View out of boat on Dam caused by weir, with headgates of canal in the distance. 2. Steam shovel below a cutting 20 feet high. Just starting. 3. Steam shovel just discharging into truck. 4. Elevating grader worked by traction engine. 5. Back view of elevating grader showing ground falling into dump wagon.

of concrete; in some instances the head on these is 40 to 70 feet. The construction of the earthen bank dam on this project is of particular interest in arriving at the methods adopted of minimising the cost, although one feature of the problem was not typical of about 99 per cent. of the dams build by our farmers; the soil was carried from the higher to the lower grade, whereas in South Africa the order is generally reversed, which gives us the disadvantage of going up with the load.

As it is undoubtedly to the earthen bank dam that the smaller or even the larger holders in South Africa will have to look for storage of their small and uncertain rainfall, the advantages of the earthen bank are obvious in a country where, up to the present, very little indications exist of producing a good and cheap cement or even lime in sufficient quantities to be used on ordinary storage works. The majority of our dam sites also militate against that class of material being used; and besides that, large supplies of cheap fuel are essential for the manufacture of both, and in this we are exceptionally deficient. On the other hand the material for the earthen bank is nearly always with us to be obtained near the site. The excavation up stream, from where the soil should if possible always be taken, forms a very valuable asset, for the surface storage can be drawn off for irrigation without exhausting the total supply for domestic use, and stock waterings.



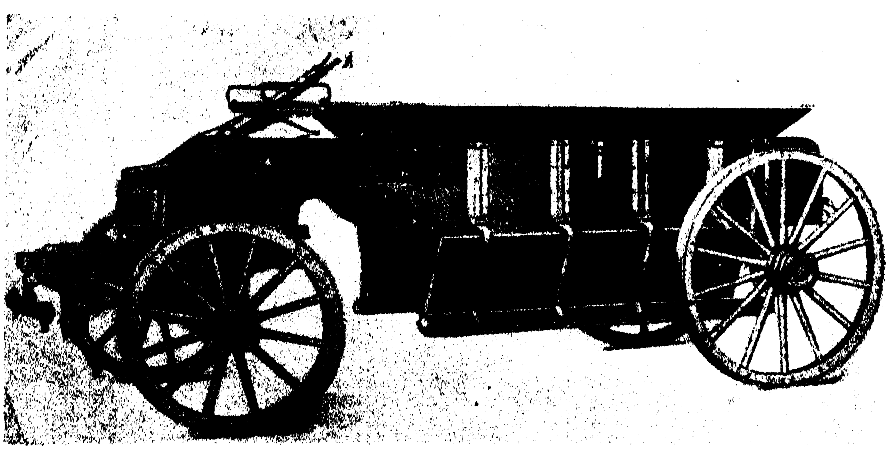
Fresno Scraper.

Construction and Handling of the Material.

The surface soil for the foundation is removed by Fresno and wheel scrapers. The former is usually employed to advantage to a depth of 3 or 4 feet, and where the dump can be done near the excavation. The wheel scraper becomes the more economical when the haul gets longer. Both implements are drawn by two horses or mules, and worked by one man, an extra team of four also worked by one man, is hooked on when the scraper is to be filled. Immediately that is accomplished, the filling teamster returns to repeat the operation. Generally an extra man is stationed at the dump. The soil is loosened by means of the plough and six horses, till a sufficient tightness in the material is reached; for the foundation the same method applies where a bank is made of not too great a height, and where the haul is not very long.

The next method employed for bringing on the ground is by means of dump wagons, in which the bottom is opened by means of a lever worked by the teamster (marked A on the illustration herewith). The filling of these dump wagons is done by an Elevated Grader (see illustration). This is claimed to be an entirely Western State machine, and is certainly one of the most useful machines for loading soil that has up to the present been invented. It is stated that its weak points are that in stone and bouldery soil it does not work so well, but that would apply to nearly all machines of such a type. The next is that the belt carrying the ground up the elevator wears out if there is an abnormal quantity of sharp grit in the soil.

The makers of this machine claim that it will elevate 1,000 cubic yards a day. I have no doubt from what I have seen of the machines at work that if it could work continuously it would do it, but so much would depend on the sufficiency of dump wagons to allow it to go on without stopping; also the size of plane on which it was operated, for too many turns would mean time wasted. But I think 500 cubic yards would be a fair estimate of an average output. I would strongly recommend that the Government import one of these machines and some of the dump wagons to give a demonstration at one of the big shows, say at Port Elizabeth, to give the farmers an opportunity to see it at work.



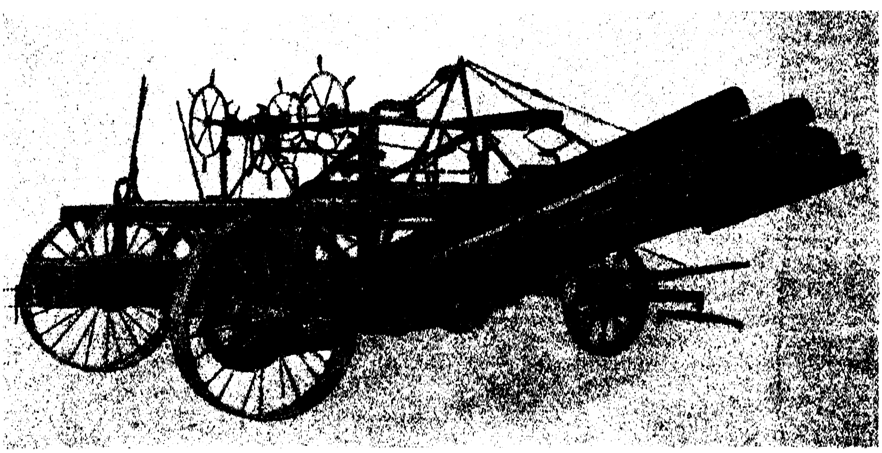
DUMP WAGON—*A*, is the lever for opening the bottom.

It may be stated, and perhaps with some logic, that if this machine has the qualities claimed for it, why has it not been imported by the big commercial houses. But we must not lose sight of the fact that machinery is imported by those firms for the purpose of profit, and they would soon enough do so, if its adaptability gives sufficient satisfaction to the farmer or would-be user. In this case, however, it is first necessary to direct thought and reason to the subject. I feel confident that the outlay would be comparatively small of importing, say, ten dump wagons and one Elevated Grader; or if that would be too expensive an item, scotch carts might be used, although they would be at a disadvantage. Dump wagons could easily be made here, but I doubt whether they would be as cheap in the first instance. A traction engine, or a good strong team of bullocks could be hired to operate it with, and teams for the dump wagons could also be locally hired. An object-lesson in that direction might lead to further development. When one thinks of the small beginning the diamond drill for water-boring had, and how larger ones followed, and eventually

the percussion drill as also the boring contractor, and the immense benefits derived from it, such an experiment should be worth attempting.

The above may be taken as the smallest plant that can be operated with hopes of success, that will expedite and cheapen construction. It is also very portable, and another feature is that it can be worked entirely by animal power. Of the two graders in use on this project one was worked by twelve horses, and the other by a traction engine. For the foundation of earthen banks the old and recognised system of the scraper, if the material can be taken out near by, is certainly the best; but we all know that in large and high banks that does not work out sufficiently economical. The second method for bringing on the soil was by means of 64 tip trucks, each containing 4 cubic yards of soil; these were filled by two steam-shovels, which could excavate 1,000 cubic yards each per day. I may mention that by far the largest quantities of ground for the centre of the bank had to be carried on by this plant; for in a wall of over the 2,000 yards long, 70 feet high at that time, the horses with the dump wagons could only work at the ends, where the distance was not so great.

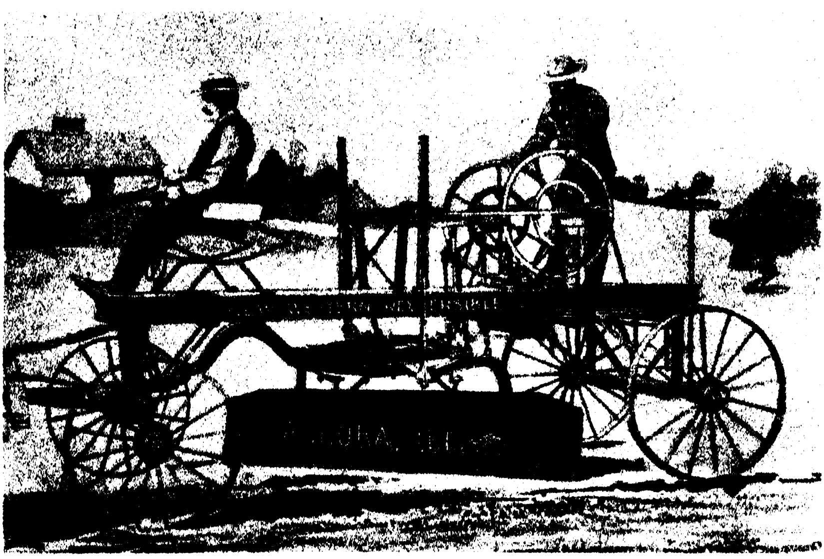
It is with diffidence one would recommend the Government to invest



Elevated Grader.

in a plant like the abovementioned. Nevertheless it will be generally acknowledged that at the present stage of mechanical invention there are always several devices for doing the same thing, and each of these devices has special merits. I am not wedded to any particular device, or system; but that there is ample room to follow methods which will expedite the construction of the earthen bank dam, very few will dispute. Many a storage work of moderate size that would be carried out by some of our farmers has to be abandoned as the cost of purchasing a plant of sufficient economical standard would be too great, and forms dead stock on completion of the work; but if such a plant could be engaged for a moderate rental it would mean that the work could be quickly and effectively carried out, as the machinery to be used would be that most applicable for the purpose. Another advantage would be that under the Government advances for works of that nature, there would be the collateral security that it is properly constructed. We know that mines, and other large industrial institutions, spend large sums of money in plants to save labour, etc. These are mostly executed by companies; with us the process of farmers forming a combination for the joint development of their properties as provided by our statute laws, has not met with the success it deserves, but

then even it would be wasteful, as there can be no continuity of use for such a plant with them. Methods differ materially with us from those in America where, outside of the reclamation service, with the projects put up for bids which is in itself a sufficient factor, outside schemes offered by water-supply companies produce a large range of contractors with appliances to suite the circumstances. With us none of these inducements are held out; it is therefore clear that only the general custodian of the public interest, which is the State, can be looked to for procuring such a plant, and rent it out to individual holders or others at a nominal rate, or under conditions that will encourage the construction of storage works. I may here mention that the small tank or dam system in India is the means of irrigating more extensive areas than the large ones, and it would apply with greater force to South Africa. The physical conditions of the Colony are more applicable to the smaller storage system that will impound from 10 to 40 million cubic feet, than those of greater capacity. There are naturally always exceptions, but these can only be built by the State directly. It may be claimed that the cost per 1,000,000 cubic feet in a big work may be less.

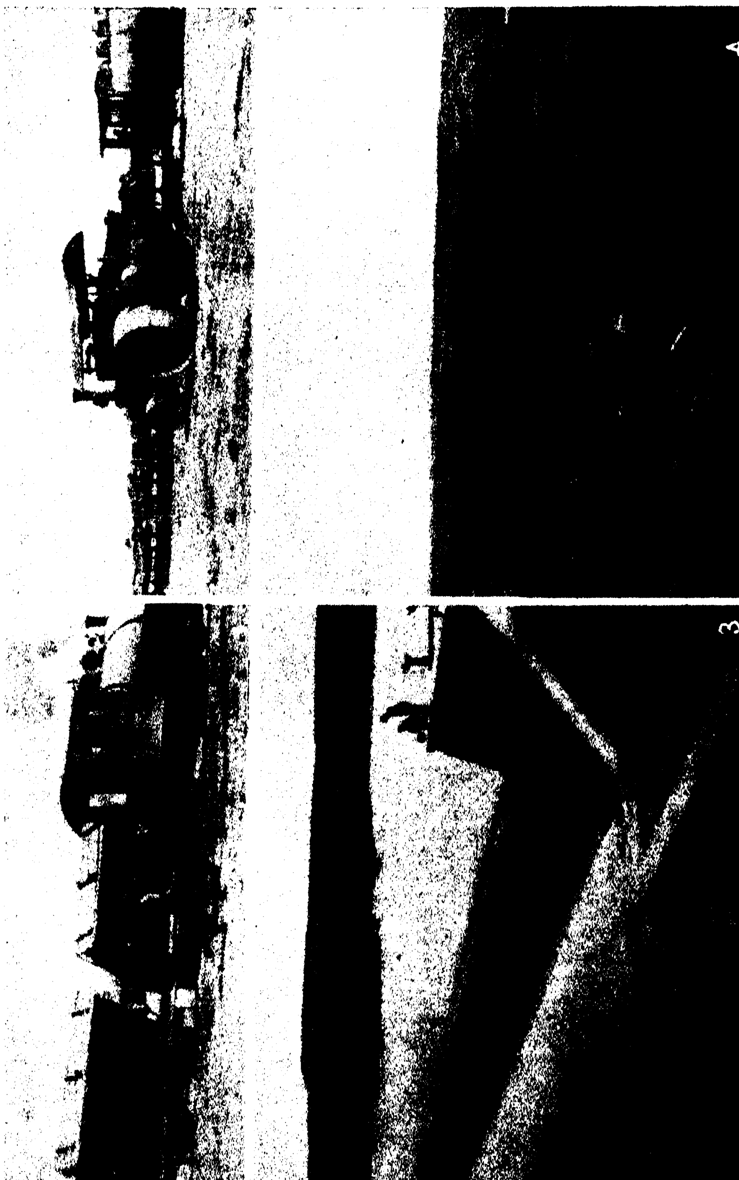


Road Machine for spreading ground.

Modification of the Steam Shovel Plant.

The great objection and drawback is the difficulty of transportation, its advantages otherwise are admitted to be enormous where labour is dear. That, I think, can be overcome in the Shovel itself by having sections of it so constructed as to be easily removed to lighten the main body. The next feature is the rails, etc., for the dump wagons. They would have to be carried by transport, but in most cases three-quarters to one mile of track would suffice, unless for very large works. The writer's experience has been that in working an 18″ gauge trolley track, 12 lb. rails, 18 cubic feet trucks, by animals, it is natural that when steam will have to be used the grade will have to be lower, and therefore the track must be longer. The mode of transportation of the plant in use at the project under review was in the following manner. The dump wagons were pulled along by

traction on their own wheels, and where sufficient and cheap power could be obtained the small locomotive could be dispensed with. If they have to be used, they can be moved as in this case was done on the ordinary road with their own motive power and wheels. The traction engine for rolling the wall will naturally always have to form part of the plant. On



1. Tip trucks and engine on Belle Fourche Dam wall. 2. Train load of ground just come to top of dam wall ready to be discharged and traction used for rolling the material fast. 3. Weir across the Shoshone River to force water into a three-quarter mile tunnel. Note the sluice gates to keep out mud and silt. 4. Bird's eye view—from inside of ground bank of the Belle Fourche Dam, 65 feet high.

this scheme it was the power employed to bring on the heavy material, as the nearest railway station was twenty miles away. The next item is fu but that depends too much on circumstances to figure on. The l down of the soil in the bank on this dam was done as follows:—Each load is spread open on the wall by means of Fresno scrapers, drawn by four

mules or horses, to the thickness of 12 inches; it was then damped by means of a hose, and rolled down by heavy traction engines. The steam roller has been condemned on account of it leaving the surface too smooth for the next layer. It will be noticed that no puddle core is made. The road machine is also used to assist in the spreading of the ground on the bank, so as to allow a minimum of work to be done by men with shovels. It will be noticed that the trolley track on the wall has to be changed frequently on account of the layers being so thin, and therefore the surface must be kept fairly even. This dam had to receive a concrete facing on the inside.

The next project was also that of the river and canal type, but the storage is obtained by means of what is claimed will be the highest concrete dam in the world when it is finished. It is known as the Shoshone Project. The features of the diversion weir and canal somewhat resemble the difficulties of our rivers. In this case it was as if the river were flowing below a "mesa" of about 150 feet high. An open canal was impossible, and a tunnel of 3¼ miles had to be made parallel with the river. On account of the high grade of the river it was possible to have the tunnel to discharge into a gulch entering the river at right angles. This was closed up by an earthen bank fitted with sluice gates, and this acts as a settling basin which can be scoured to prevent silt from entering the canal, and also to flush the tunnel. Further precautions are taken at the intake of the tunnel to prevent silt from entering, by having a concrete wall up stream from the weir for some distance, and as the take-off into the tunnel is in a bend of the river, a considerable quantity of silt will settle on the spill-way side of the wall. In front of the tunnel another wall curves right round it, but low enough for the water to spill over it into the tunnel. This basin can be secured by lower gates in the concrete weir. The weir for diverting the water into the tunnel consists of an 18-feet high reinforced concrete structure.

In course of construction 16 miles higher up is the concrete arch dam, when complete to measure 315 high; it is in a gorge 85 feet wide at the bottom and 300 feet wide on the top. It is estimated to hold up 454,000 acre feet. Its catchment area is 1,380 square miles, and comprises some of the Rocky Mountains, the snows of which cause the river to flood from June to July. Where the irrigation is to be carried out the rainfall is only from 6 to 10 inches per annum. A work of this nature might with advantage be undertaken in Meiring's Poort and also in Tooverwater's Poort, in our own Colony, to hold up some of the water that goes to waste, but could only be constructed by the State.

Of the Canal type of structure, independent of storage, I visited two, one on the Yellowstone River, and one on the Colorado River; but we have few perennial or living streams which can still be utilised in that way. For I think outside of the Orange and the Breede Rivers, few advantages exist for the reclamation of land by irrigation in that direction in the Colony proper. They are undoubtedly less costly in the end, and assure to the irrigators a permanent supply, which in the other types must necessarily fluctuate according to precipitation.

Settling and Occupancy of Irrigation Schemes

On this largely depend the success of a scheme. Under the Government projects the irrigators receive allotments in size of acreage according to the decision of the Minister of the Interior as to what would support a family. It ranges from 40 to 80 acres, payments to be made in ten annual instalments. This includes the cost of construction and maintenance of the project, but no interest charges on the capital outlay. It is intended that this amount reverting thus would again be invested in reclamation

works. To prophecy that the period in most cases will prove too short is, I think, safe; of course the settlements have not been in occupation long enough to judge definitely. Any scheme in South Africa that could command as permanent a water supply to the irrigators, as those I inspected, should, I feel confident, prove successful, although our market for the best paying crops, such as fruit, is very restricted at times. One has only to notice the erfholders or irrigationists in Graaff-Reinet. Comparing our soils with those of the United States, in their and our dry region, ours is essentially a fruit-growing soil, but in the absence of local markets, our aim should be the growing and storing of fodder crops for fattening or carrying our stock through periods of drought.

The National Irrigation Congress.

This was the sixteenth Congress. It was very well attended by a large number of foreign delegates, and it was very representative of all the States in America. The main objects of the Congress are: to prevent the denudation of the forests, store the flood waters, reclaim the desert land, and to make homes on that land. This programme is sufficiently comprehensive and formidable for any organisation. In a semi-arid country it is certain that an exchange of opinions, and a combination of those interested in irrigation can do much in assisting the central Government. This was the first Congress to which official invites from the Government of the States to foreign countries had been sent, and to which the State Congress sanctioned the appropriation of public funds in aid of its necessary expenses, giving it thus more of an official status. The papers read and the proceedings of the Congress can better be followed from the official minutes, edited by Mr. Ralph E. Twitchell.

We Have to Lead, and They to Follow.

Comparing conditions in the West of America with those in South Africa, especially in the Karroo, I find in the first place that they have more living or perennial streams, the sources of which are for certain replenished annually by snowfall on the higher altitudes. To make this clearer, one has to take the Zwartberg Range which feeds a number of perennial streams. On a larger scale they have the Rocky Mountains, which give them larger streams of surplus water as yet; ours of a like nature we have already exploited; they will also in time utilise all from that source.

Our future therefore lies in the direction of conservation of our rain-water; may that be by holding it up on the land in whatever method may seem the most practicable, by obstructing its passage to the sea, and make it fight its way inch by inch, so to speak, be those obstructions, dams to store a quantity right away, or of barring its downward career by placing weirs and turning it out on to land, be that land arable or not, but which will act as a sponge to retain a percentage, not alone of the water, but of the silt and sediment.

Storage in South Africa.

Our soils in the majority of cases are very fit for conservation works, being a stiff loam, forming good material for earthen banks, as also for retaining the supply without undue seepage. Much is said about our country sluiting. A great deal of that is due to the excessive flow of water, the prevention of which is really the root of the evil; and if at the upper end of our Karroo leegtes, and where the flow is still sufficiently small to be brought under control, a dam could be constructed to keep back a quantity of the water, sluiting could be very much more effectually dealt with lower in the valley. Our dams should be trebled, and then our bore-holes

would not dry up so soon when a drought sets in; but this could only be done by being able to construct dams quicker and cheaper. Coming to India where tanks or dams, of the same type common to every farmer here, exist in thousands there they can be constructed in a very primitive way, as the labour is so cheap, but for the European farmer of this country the methods of the Ryot would offer no attraction. In Egypt the Fellah is inherent to irrigation, but his supplies are certain, and only need distribution somewhat different to what Nature provides.

In conclusion I may say that in South Africa the problems are very different to any of the above countries, and in its uniqueness one can only with success apply small sections of devices and systems prevailing in other countries. To obtain the mechanical devices that would answer better in South Africa, prizes should be offered to induce people to make machinery that will better suite the state of affairs here.

ANALYSES OF COLONIAL SALT.

(By E. V. Flack, Government Analyst).

By way of supplement to the record of analyses of salt from South African salt pans, published in Volume 33 of this *Journal*, pages 648 to 655, it may be of interest to place on record the analyses of twelve samples of Colonial salt exhibited at this year's Port Elizabeth Agricultural Society's Annual Show.

Nos. 1, 2, and 3 were from the Zwartkops Saltpan Co., and were awarded the second prize.

Nos. 4, 5, and 6, which were from the Victoria Saltworks, Middlepan, P.O. Schoombie, took the first prize.

Nos. 7, 8, and 9 were exhibited by the Jacobsdal Saltpan, Orange River Colony.

Nos. 10, 11, and 12 were exhibited by Clarke's Varsch Vlei Saltworks, Maraisburg.

Of these, Nos. 1, 4, 7, and 10 represent fine salt; Nos. 2, 5, 8, and 11 medium salt; and Nos. 3, 6, 9, and 12 coarse salt.

The following are the results obtained by analysis of these salts; the figures for "moisture" having been in each case arrived at by difference:

Serial No.	Calcium Sulphate.	Calcium Chloride.	Magnesium Sulphate.	Magnesium Chloride.	Sodium Sulphate.	Sodium Chloride.	Moisture.	Insoluble matter.
1	·67	nil	·04	·34	nil	97·29	1·62	·04
2	·38	nil	·18	·46	nil	97·12	1·82	·04
3	·49	nil	·19	·44	nil	96·79	2·06	·03
4	·18	nil	·16	nil	·01	99·09	·54	·02
5	·20	nil	·16	nil	nil	99·19	·43	·02
6	·16	nil	·25	nil	·11	98·02	1·46	·01
7	·11	nil	·07	nil	·24	99·43	·14	·01
8	·14	nil	·04	nil	·13	99·19	·45	·05
9	·33	nil	·05	nil	·60	98·26	·73	·03
10	·39	nil	·44	nil	1·48	96·63	·96	·10
11	·27	nil	·38	nil	1·02	97·45	·78	·10
12	·29	nil	·29	nil	·60	95·94	2·80	·08

NITRATE OF SODA OR SULPHATE OF AMMONIA?

By C. Mayer, late Agricultural Assistant.

The contents of the *Agricultural Journals* of 1909 show that the important matter of correct and profitable manuring is still receiving the attention it deserves. Judging from the results already obtained there is no doubt that a complete manure,—that is a manure containing Phosphoric acid, Nitrogen and Potash—will give the best returns where, owing to the scarcity of kraal manure, artificial fertilisers must be resorted to.

In perusing these reports it struck me that the application of Sulphate of Ammonia has as yet not been tested, and that in consideration of the importance nitrogen plays in the production of farm crops, Sulphate of Ammonia might also be profitably applied. On the Continent, particularly in Germany, the use of Sulphate of Ammonia is rapidly growing, and its preference to Nitrate of Soda is advocated on the strength of numerous experiments. If Sulphate of Ammonia should be found to answer at the Cape, the prospects for a new local industry open, as Sulphate of Ammonia is the bye-product of the gas factory, so that it might be locally produced and make the Cape farmer independent of Nitrate of Soda, which is sure to become more expensive in the course of time proportionately to the decrease of the existing deposits.

This consideration has presumably, together with the proved utility, given rise to a considerable progress in the production of Sulphate of Ammonia, as may be seen from the appended list giving the production in the most important parts of the world.

	1900.	1903.	1905.	1906.
Germany produced tons	130,000	140,000	203,000	256,000
England produced tons...	220,000	237,000	260,000	283,000
France produced tons	37,000	47,000	47,000	149,000
Belgium, Holland produced tons ...	33,000	35,000	35,000	35,000
Austria, Russia, and Spain produced tons	35,000	45,000	45,000	45,000
United States produced tons	12,800	12,800	12,800	12,800

Just like the increase in the production, the increase in the consumption of Sulphate of Ammonia in Germany may be mentioned as a striking proof of its usefulness. While Germany used in 1898 76,000 tons the consumption in 1902 had risen to 273,000 tons, whilst the consumption of Nitrate of Soda must have proportionately decreased.

The advantage claimed for Sulphate of Ammonia over Nitrate of Soda are the following:—(1) Sulphate of Ammonia contains from 20 to 21 per cent. of Nitrogen as against 15 per cent. in Nitrate of Soda, consequently about 73 parts of Sulphate of Ammonia are equal to 100 parts of Nitrate of Soda, a not unimportant matter where fertilisers have to be transported a long distance and important also in regard to the labour required in distribution on the land. (2) Sulphate of Ammonia is absorbed by the soil,

and can therefore not be washed into the lower parts beyond the reach of plants as is the case with Nitrate of Soda. (3) Sulphate of Ammonia changes gradually into Nitric Acid, and provides therefore a uniform supply of Nitrogen, lasting throughout the time the plants are on the land. (4) Sulphate of Ammonia, in consequence of its slower action, does not stimulate plant growth like Nitrate of Soda, and produces crops less liable to disease. This last point is corroborated by Cape experience, for Mr. A. K. Hards says in his article in the *Agricultural Journal*, No. 2 of 1909: "It will be noticed that when Nitrate of Soda was used in excess of the other ingredients, there was a tendency for the crops to go down to rust." (5) In its action, does it not depend like Nitrate of Soda on an abundant supply of moisture in the soil, it continues to produce good effects even in dry weather. (6) It does not harden soils like Nitrate of Soda, and commends itself therefore for heavy soils. (7) It produces fruits of a better quality and greater durability. (8) It has a considerable residual value and considerable advantages accrue from its application in the second year still. (9) It may be given as one dose and can in most instances be applied like other fertilisers at the time of ploughing respectively harrowing of the land, which means a considerable amount of labour-saving.

To avoid improper use of Sulphate of Ammonia it may be mentioned that it can be mixed with potash manures and superphosphate, but never with Basic slag or lime. Where the last two fertilisers are used they should first be spread and harrowed in when Sulphate of Ammonia may follow. To assure its thorough distribution it must be mixed with an equal amount of sand.

Applied in this way, Professor Dr. Fischer, of the University of Leipzig, obtained with rye on heavy soils the following results per hectare or 2¼ acres:—Without nitrogenous manure, 14 cwt. of grain; with 150 lbs. Nitrate of Soda, 15 cwt. of grain; with 125 lbs. Sulphate of Ammonia, 17 cwt. of grain. Oats on the same land yielded per hectare:—Without Nitrogenous manure, 8 cwt. grain; with 100 lbs. Nitrate of Soda and 100 lbs. Superphosphate, 10 cwt. of grain; with 100 lbs. Nitrate of Soda and 200 lbs. Superphosphate, 12 cwt. of grain; with 75 lbs. Sulphate of Ammonia and 100 lbs. Superphosphate, 17 cwt. of grain; with 75 lbs. Sulphate of Ammonia and 200 lbs. Superphosphate, 15 cwt. of grain.

Director Pflaumer, of Neuburg, on the Danube, obtained in respect to potatoes from the same area with 1¼ cwt. of 40 per cent. Potash Manure, 2 cwt. Superphosphate, and 2 cwt. Nitrate of Soda, 17 cwt. of potatoes. With 1¼ cwt. 40 per cent. Potash Manure, 2 cwt. Superphosphate, and 1½ cwt. Sulphate of Ammonia, 44 cwts. of potatoes.

Interesting are also the results of comparative experiments at the provisional experiment station at Brechte, published in the annual report of the Province of Westphalia for 1907-1908.

Rye per hectare.

Without Nitrogenous Manure.	150 kg. Sulphate of Ammonia.	200 kg. Nitrate of Soda.	200 kg. Sulphate of Ammonia.	266 kg. Nitrate of Soda.	
35 cwt. grain	51 cwt. grain	48 cwt. grain.	52 cwt. grain	45 cwt. grain	1 kg.=2.2046
66 „ straw	84 „ straw	67 „ straw	95 „ straw	78 „ straw	lbs. English.

Oats per hectare.

34½ cwt. grain	53 cwt. grain	51 cwt. grain	56 cwt. grain	55 cwt. grain
44 „ straw	81 „ straw	80 „ straw	95 „ straw	92 „ straw

Mangolds per hectare.

400 cwt. roots	630 cwt. roots	632 cwt. roots	815 cwt. roots	725 cwt. roots

In respect to results on light sandy soil, where strong rains would wash Nitrate of Soda rapidly down and render it to a considerable degree ineffective, writes the Experiment Station of Munster in Westphalia in their report of 1908, that the experimental plots manured with Nitrate of Soda suffered considerably under the dry weather prevailing through almost the whole of last summer, whereas the plots with Sulphate of Ammonia were normal, and brought their crops to proper maturity.

Further trials of interest are those of Professor Beiler, published in the *Agriculturist* of Luxembourg of 1909, as they cover a number of years, and were simultaneously carried out on light and heavy soil, and have not only reference to the total production, but likewise to the quality of the product. Phosphoric and potash manures were applied in autumn, Sulphate of Ammonia three weeks before planting, while Nitrate of Soda was applied in two applications as a top dressing.

A.—Experiment on Sandy soil average of 8 trials per hectare.

Year.	Stable Manure.	Phosphoric, Potash and Nitrate of Soda.	Phosphoric, Potash and Sulphate of Ammonia.
1906	484·00 cwt.	477·00 cwt.	502·00 cwt.
1907	437·00 ,,	482·00 ,,	494·00 ,,
1908	435·60 ,,	424·40 ,,	472·00 ,,

B.—Experiment on loamy soil per hectare average of 11 trials.

1906	422·80 cwt.	428·00 cwt.	439·60 cwt.
1907	419·00 ,,	415·00 ,,	493·00 ,,
1908	444·20 ,,	408·00 ,,	436·00 ,,

Percentage of small, large, sound and diseased potatoes in respect to A.

	Stable Manure. *Potatoes.*				Phosphoric Acid, Potash, Nitrate of Soda. *Potatoes.*				Phosphoric Acid, Potash, Sulphate of Ammonia. *Potatoes.*			
Year	Large.	Small.	Sound.	Diseased.	Large.	Small.	Sound.	Diseased.	Large	Small	Sound.	Dis'd
1906	85·30	14·70	97·50	2·50	81·40	18·60	...	...	96·50	3·50	100·00	...
1907	85·00	15·00	100·00	...	77·60	22·40	97·70	2·30	97·00	3·00	100·00	...
1908	80·60	19·40	95·80	4·20	80·20	19·80	93·90	6·10	95·50	4·50	98·30	1·7

Percentage of small, large, sound and diseased potatoes in respect to B.

1906	87·90	12·10	96·30	3·70	85·60	14·40	97·90	2·10	94·10	5·90	100·00	...
1907	88·20	11·80	95·90	4·10	84·80	15·20	98·20	1·80	94·70	5·30	98·80	1·20
1908	81·60	18·40	93·00	7·00	84·50	15·50	93·80	6·20	96·50	3·50	98·10	1·90

An analysis of the potatoes in respect to their contents of starch gave with regard to A on the average 1·66 per cent. over stable manure only, and 1·30 per cent. over Nitrate of Soda in favour of Sulphate of Ammonia, whereas in regard to B, the average amounted to 16·56 per cent., or a gain of 1·23 per cent. and 0·23 per cent. in favour of Sulphate of Ammonia.

Commenting on these results, Professor Beiler is of opinion that the Sulphate of Ammonia is in every respect preferable as manure for potatoes to Nitrate of Soda, and refers to the beneficial effect of Sulphate of Ammonia on the soil, as the soil so treated remained loose and mild, whereas the plots with Nitrate of Soda became hard anl crusty.

Director Gaul, of Hildburghausen, publishes in the German *Agricultural Press* of the 19th December, 1908, the following average results of eleven experiments on ¼ hectare each with potatoes:—(1) Without manure, 104·96 cwt.; (2) with 100 lbs. Superphosphate and 50 lbs. Potash, 112·32 cwt.; (3) like 2 plus 75 lbs. Sulphate of Ammonia, 125·27 cwt.; (4) like 2 plus 125 lbs. Sulphate of Ammonia, 135·81 cwt.

Similar tests and results could be enumerated in regard to other crops, but the foregoing may suffice. It must, however, be mentioned that with garden crops the application of Sulphate of Ammonia is also strongly recommended by competent men. Though there are no exact data obtainable, there is no reason why Sulphate of Ammonia should not equally well answer, especially when applied to cabbages and smaller crops requiring a free supply of nitrogen, and there is not the smallest objection to its use in orchard and vineyard at the rate of 400 to 600 lbs. per Cape morgen.

Referring to the quantities of Sulphate of Ammonia generally applied, the same must necessarily vary according to the nature and condition of the soil and the requirements of the particular crop. It may also be advisable to apply at the Cape smaller quantities than are generally used in Europe, of which I append the following list:—

(1) *Wheat.*—From 100, 150 to 250 kg. per hectare, to be applied at the time of working the soil respectively previous to harrowing same.

(2) *Rye.*—From 75, 150 to 200 kg. per hectare. Application like under wheat.

(3) *Barley.*—50, 75 to 150 kg. per hectare. Application as above. Where barley so grown as green fodder the larger quantity will be found useful.

(4) *Oats.*—100, 150 to 200 kg. per hectare. Application as before.

(5) *Maize* (Mealies).—100, 150 to 300 kg. per hectare. Application shortly before planting. The larger quantity should be given where the crop is grown for feeding purposes.

(6) *Mangolds.*—When kraal manure is simultaneously used, 200 to 300 kg. per hectare. When no kraal manure is applied, 350 to 500 kg. to be applied and harrowed in shortly before planting.

(7) *Potatoes.*—With kraal manure, 150 to 200 kg.; without kraal manure, 250 to 300 kg.; to be applied a few days before planting, and well harrowed in.

(8) *Tobacco.*—150, 200 to 300 kg. per hectare.

(9) *Leguminous Plants.*—50 to 100 kg. per hectare. Though such crops do not require nitrogenous manures, small quantities of Sulphate of Ammonia have been found to have a beneficial effect in their early stage of development.

THE MAKING OF CHARCOAL.

(By F. E. KANTHACK, A.M.Inst.C.E., Director of Irrigation.

During the past two years South Africa has been introduced to a source of cheap power in the form of the gas engine driven by means of gas drawn from what is known as a "Suction" Gas-Producer. As cheap power is one of the most crying wants of the Cape Colony, it is not to be wondered at that this new type of power producer should have, at once, excited the keenest interest amongst all classes of the comunity, and should finally have become popular. It is becoming particularly popular amongst farmers for pumping purposes in connection with irrigation schemes. In England, whence this type of plant has come, the fuel used in the generators is entirely confined to anthracite of the best kind, and in that country the cost of fuel when using Welsh anthracite beans at 20s. per ton does not exceed one penny for ten Brake Horse-power per hour. The earliest plants in this Colony were worked with Welsh anthracite, and there are several, especially near the ports, which still use either Welsh or Belgian fuel. Natal anthracites were next tried and have given good results, but with all coal fuels, whether Colonial or imported, the freight, rail and road transport charges made them relatively costly, and as in irrigation pumping plants the margin of profit is often not very great, it was of prime importance to try and lower the cost of suitable fuel as much as possible. Now good wood charcoal ranks equal with Welsh anthracite in a suction gas-generator, provided the generator is proportionately larger and the charcoal is thoroughly charred so as to contain no tarry matter, and is free from dust. This country is, in its present burnt-out and dried-up condition, very poor in tree growth, yet it generally happens that where there are facilities for pumping on a fairly large scale there is also a plentiful supply of bush and trees which are suitable for charcoal manufacture. Where such a fuel supply exists and is converted into charcoal within reasonable distance of the engine, the cost of power becomes remarkably low.

A farmer is, however, apt to treat his trees and bush as valueless rubbish, and many would think nothing of sacrificing acres of it. I wish to be no party to any destruction of forest growth, where such growth is beneficial or necessary for the conservation of water, the prevention of erosion or the like, but in our Karoo valleys the lands best suited for agricultural purposes are often covered with dense scrub of mimosa, which must be removed to make room for cultivated lands. There are also thickets of willow, poplar and other trees which require removal or thinning. The natural veld bushes and trees and those on the mountains and in the kloofs should not be sacrificed for charcoal. It would be more economical to import Welsh anthracite. The fringes of trees and bush along the margins of rivers also require to be cut with great caution, as their removal may in many cases lead to the loss of much valuable land by river erosion.

Granted that a farmer has trees and bush which he either must cut or may conscientiously cut, it now remains to study how he can get the greatest amount of charcoal out of the wood at the smallest cost. It must be remembered that the wood fuel supply is strictly limited, and it behoves every one, therefore, to adopt such methods which will give the greatest outturn of charcoal.

The methods employed generally in this country are of the crudest and most wasteful kind and almost criminal in a country like this where fuel is very scarce. As the fuel supply is generally scattered, it is generally more convenient to make the kilns as near as possible to wherever felling is taking place, and therefore move the site of the kilns from place to place rather than erect permanent kilns and transport the wood long distances to it.

Wood Used for Charcoal-making.

Any species of wood may be carbonized, but the method employed varies with its density or greater or less combustibility. If two kinds of wood are placed in the same kiln it is possible that one species may be burned to ashes before the other is properly carbonized. It is advisable, therefore, to pile only one species of wood at a time in a kiln. All the wood used should be sound and air-dried. It should not be dead wood, and rotten wood is useless. The billets should be cut into short lengths of from 2 to 3 feet. All pieces over three inches in diameter should be split into small pieces. In order that the wood may be packed closely, all snags and unevennesses must be trimmed off. Crooked and bent branchwood can be used only in short pieces. Short pieces can all be used for filling up interstices.

Shape and Size of Kiln.

The shape of a kiln is that of a parabaloid, and the volume of such a kiln is given approximately by the formula:

$$\text{Volume} = \frac{g^2 \times h}{25{\cdot}13} \text{ or } \frac{g \times g \times h}{25{\cdot}13}$$

where g = the girth and h = the height of the kiln. The size varies greatly. A capacity of from 1,000 to 1,400 cubic feet, that is with a girth of 65 to 75 feet, is considered the most economical in working.

Site for a Kiln.

The site for a kiln should be level, sheltered from winds and close to a small supply of water for quenching purposes. The nature of the ground below the kiln has considerable influence on its rate of burning. A sandy loam is most suitable, and the site improves after several kilns have been burnt on the same spot.

A new site for a kiln should be prepared as follows:—The ground must be freed from all sticks, rocks and stones, and dug over and worked up evenly as for a garden bed, and made perfectly level. From a stake driven in the centre a circular line should then be traced, marking the boundary of the kiln should be raised some 6 to 12 inches and the ground made to slope evenly in all directions from the centre like a very flat cone. This slope is necessary in order that tarry matter distilling from the wood may drain away and to increase the inward draught of air. The conical site should be carefully and thoroughly consolidated, and should remain unused for some considerable time. Before piling the kiln, a heap of dry brushwood should be burned upon the site in order to dry it. A new kiln site is always inferior to an old one. It is stated that the loss of wood in using a new site may amount to from ten to twenty per cent.

Erection of the Kiln.

To form the flue in the centre, four poles or stakes are driven into the ground, forming a square with four feet sides. They are bound round with withes or twisted thin branches, and form a hollow chimney. The

shaft is then filled with dry shavings, branchwood or other inflammable material which must be packed very loosely. Kilns are fired sometimes from above and sometimes from below. In the present article it is assumed

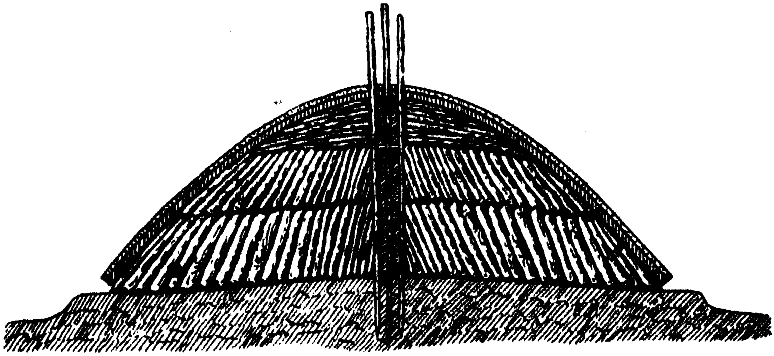


FIG. 1.

(From Schlich's *Manual of Forestry.*)

that the kiln will be kindled from above, and in this case the most inflammable material must be placed at the top of the flue. Next, finely split pieces of perfectly dry wood are placed around the shaft, the interstices being filled with dry shavings, etc. The flue and the zone immediately surrounding it thus form a core around which the regular kiln is constructed. Around this core billets of wood are placed nearly vertically,

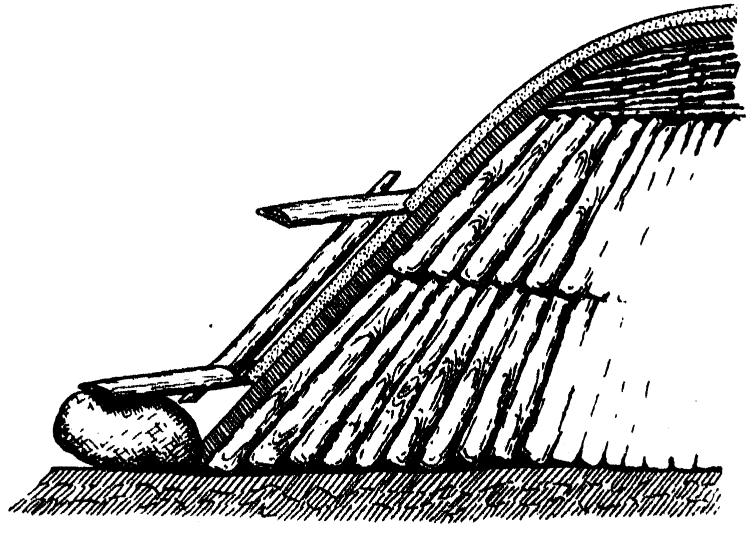


FIG. 2.

(From *Natal Agricultural Journal.*)

i.e., sloping slightly towards the flue, in concentric circles until the outer boundary line of the kiln is reached. Two tiers are thus packed, the billets in the upper tier sloping inwards slightly more than those in the bottom tier. The billets should be packed with their thick ends downwards and their split sides inwards. Small dry pieces should be placed

nearest the flue, and the thickest pieces about half-way between the centre and the circumference, as these burn slowest. Outside these thick billets smaller pieces are again packed. The upper tier should be started as soon

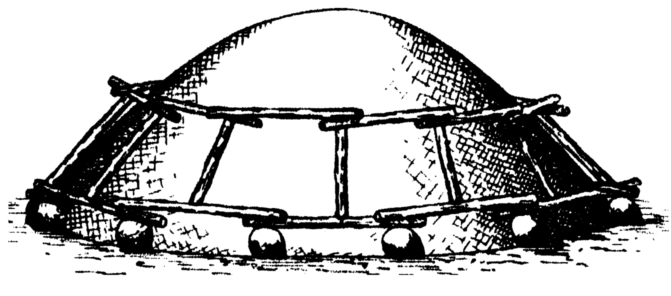


FIG. 3.

(From *Natal Agricultural Journal.*)

as the lower tier has progressed some distance from the flue, so as to facilitate packing. It is essential that the billets should be packed as closely as possible with all interstices packed with smaller pieces so as to produce as compact a mass of wood as possible. If this is not done, much trouble may be experienced in burning.

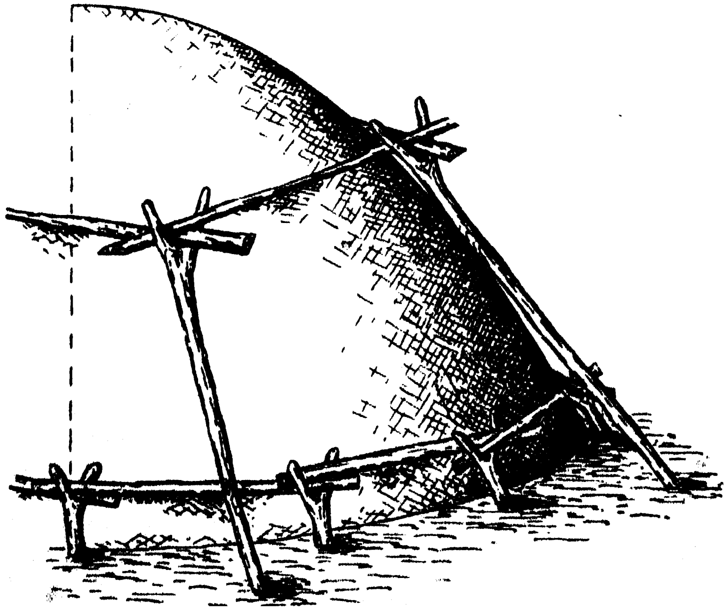


FIG. 4.

(From *Natal Agricultural Journal.*)

The top of the parabaloid is completed by packing short pieces of very dry wood placed almost horizontally with all interstices carefully filled in with small pieces. This completes the charging of the kiln. (See figure 1).

Supporting and Covering the Kiln.

Before the kiln can be fired it is necessary to apply two coverings, termed an inner and an outer covering respectively; and in order that they may not collapse they are supported by two tiers of wooden supports or props, termed the lower and upper supports respectively. Every kiln requires at least the lower supports which are formed of stout, short, forked pieces of wood driven into the ground all round the edge of the kiln. Split billets of wood are placed in a circle all around the kiln with their over-lapping ends locked in the prongs of the forked pieces. The forked pieces may be replaced by a row of stones as big as a man's head, on which the split billets are placed contiguously in a circle a few inches from the ground. This circle of split billets forms a footing for the covering to rest upon and allows air to pass freely underneath into the kiln. The upper supports form a similar circle higher up the kiln, resting on vertical billets or forked pieces of wood. These upper supports are placed in position after the kiln has been covered. (See Figures 2, 3 and 4.)

The inner covering is made of leaves, sods, long grasses or green branches. Thin sods placed like tiles on a roof form the densest covering. The coating should be started from the top of the kiln and must be thick enough to prevent earth from penetrating through it.

The outer covering is made with fairly wet "dagga" or mud mortar. "Dagga" mixed with charcoal dust, gives it the right consistency. This covering must be such as to serve as a dense coating to the kiln, but not so dense as to become hard with the heat. It should remain soft enough during burning to yield to the gradual sinking of the kiln without cracking, and must allow the steam to escape.

The outer covering is begun at the base on the top of the lower supports. It is carried up to a little above the level of the upper supports which are then placed in position over it, and is finally continued up to the top. The thickness of the covering varies, being about 1¼ inches at the top and 2¾ inches at the base.

If the site of the kiln is not in a very sheltered position, a wind-break as high as the kiln itself, made of branches, etc., should be erected

Kindling and Burning.

The kiln should be fired always on a still morning before daybreak. Fire is applied to the top of the flue, care being taken to see that the space under the lower supports is open. If the fire has caught properly, first the flue and its contents are burnt and the fire then spreads to the adjoining billets. As soon as the dome becomes very hot, steam mingled with thick smoke issues from it. At this stage there is always some danger of bursting, owing to the formation inside the kiln of an explosive mixture of air and combustible gasses, or a sudden development of steam. If such were the case, the covering would be blown off and the piling of the wood disturbed. Too loose a soil under the kiln or too rapid burning may thus imperil matters. The risk of bursting is greater with dry than with slightly green wood. If the kiln is observed to be burning too rapidly, and that a large amount of steam is being produced, the open spaces below the lower supports should be closed.

After a few hours the smoke acquires a pungent odour, a sign that the wood is being decomposed, and that carbonization is in progress. Charcoal is formed first in the dome of the kiln, proceeding downwards in the form of an inverted cone. The dome sinks down, carrying the covering with it. If the carbonization proceeds properly, a flame should issue from the top of the chimney in the form of a symmetrical cone, widening out

more and more till flames protrude from the base of the kiln. The burning must be kept symmetrical and at a regular pace. The draught must be carefully regulated so that one portion will not burn faster than another.

The spaces under the lower supports are usually closed up directly charcoal begins to form, though they may be partly or wholly left open for some time longer if more draught is required. In either case a few vent holes, some 6 or 8 inches square, should be made through both coverings close to the top of the kiln. These vents are made all round the top if the air is still, or on the leeward side only if a breeze is blowing. These enable steam and smoke to escape readily and minimise the danger of the covering cracking or bursting.

After a time the smoke issuing from these top vent holes loses its moist and flocky character and turns a pale blue colour. This denotes that charcoal has been formed in the upper portion of the kiln, and these holes should be closed with moist "dagga." As the charcoal forms in the dome, the kiln sinks down carrying the covering with it, which should adhere firmly. Should there be any signs of cracking at this stage, the covering should be watered from the rose of an ordinary watering-can, and beaten down gently with the back of a spade. Wherever advisable, the covering may be strengthened by an additional layer of moist earth. At this stage the openings at the base of the kiln must be closed and another tier of ventholes opened about two feet below those just closed. These vents should be to leeward or all around, according to whether there is any breeze blowing or not. As soon as smoke from these holes indicates that charcoal has been formed there, they should, in turn, be closed and a third tier of vent holes opened below, and this process of drawing the fire downward and outward repeated tier by tier till the base of the kiln is reached, when carbonization is completed.

As stated above, a hollow will form at the top of the kiln, and through bad sites or faulty packing or various external influences hollows may form in other parts of the kiln. If these hollows are left unfilled, the covering may fall in and the kiln burst into flame or the hollow may cause a draught in that part and cause irregular burning and a poor outturn.

When a marked depression is noticed in the covering, all vent holes must be closed at once and wood and material for filling and covering collected by the burner. After the kiln has been closed for not less than one hour, the covering over the hollow must be removed, the contents of the kiln pressed down with a piece of wood, and the hollow filled with short pieces of wood and charcoal. The patched spot must then be covered over with the same material as the inner covering and with "dagga" and beaten down with a shovel. The flue, which burns away at once, must be filled in the above manner the first evening, and this filling has often to be repeated every evening for several days.

Great care must be taken to reduce this process of filling hollows as much as possible, as charcoal is thereby wasted. Every evening all cracks in the covering should be carefully sealed up with "dagga," all necessary filling of hollows effected, and if the weather is stormy all vent holes should be closed up. Where the charcoal has already been formed, that portion of the kiln should be beaten down and covered with wet "dagga."

Cooling of the Kiln.

As soon as the wood is entirely carbonized, which is shown by the clear flames coming out at the bottom of the kiln, the entire surface of the kiln must be rendered with wet "dagga," and all vent holes must be stopped up. After twenty-four hours the covering is removed in strips,

and fresh damp earth is applied quickly to the glowing charcoal. This process extinguishes all fire and causes the kiln to cool rapidly.

Removing the Charcoal.

In order that the charcoal may be of good quality, it should not remain any longer than is necessary in the glow of the kiln. At the same time it must be removed very gradually, otherwise the kiln will break into flame. Drawing the kiln is commenced in the evening and work continued during the night when flames may be more readily seen. The following method is adopted: The burner, with a long pronged pitchfork, opens the kiln on the leeward side, and removes as much charcoal as he can without setting the kiln ablaze. The charcoal thus drawn is quickly raked to one side and usually watered whilst the hole is filled with water. The kiln is then opened in another place, and the process is repeated until there is nothing left but its centre, consisting of small pieces of charcoal, earth and ashes, which are finally raked out and allowed to cool. When the charcoal has cooled, it is sorted out according to size. Dust and ashes are used in the covering of the next kiln.

The above description is condensed from the chapter on Wood Carbonization in Vol. V. of Schlich's Manual of Forestry.

A more or less impure form of carbon is obtained from all vegetable or animal matter by ignition out of contact with air. The quantity and quality depend upon the material used. By distillation 25 to 27 per cent. of weight can be obtained, but by ordinary methods of charcoal burning, the yield is less. By the method described above the outturn may run as high as 50 per cent. by volume, but with shifting kilns and with burners who are not experts at the work, the outturn would probably be less. Until we have a number of trained charcoal-burners, working in accordance with the best practice, it is impossible to say much about the possibilities of Colonial woods. The Forest Department are now systematically burning charcoal from wattle wood at Kluitjes Kraal, near Ceres Road, and at Fort Cunningham, in the Eastern Province, but no data are available regarding the outturn. The Forest Department are selling charcoal at these places f.o.r. at £2 per short ton.

As to the best woods to use for charcoal for suction gas generators, considerable further inquiry and experiment are necessary. In most cases the choice is limited to a particular species, generally mimosa, but there are cases where several species are available, and it is important to know which of these is the best. So far Mr. F. B. Parkinson, Assoc. R.S.M., is the only qualified person who has undertaken any comparative experiments which are described on pages 710 *et seq.* of the *Agricultural Journal* for December, 1908, and in which he shows that of the three varieties, willows, Kaffir thorn and karree, charcoal made from willow is the most efficient gas-producing fuel. More extended tests with other woods are badly required, more especially as regards mimosa, poplar, bluegums, wattle and tamarisks. Several of these are very easily propagated and quick growers.

It is hoped that the crude and very wasteful methods now generally adopted of burning charcoal in pits will be discontinued. This common method was recently described in connection with an article on Irrigation by Pumping on the Fish River in the *Agricultural Journal* for May, 1909. The kiln method is slower but quite as mobile as the trench method, and the yield is so much greater and the quality of the charcoal so much better that there can be no comparison between the two.

THE REFRIGERATION OF HORTICULTURAL PRODUCTS AND THE EXTENSION OF MARKETS.

By HAROLD G. POWELL, Pomologist in Charge of Fruit Transportation and Storage Investigations, U.S. Department of Agriculture.

At the First International Congress of the Refrigerating Industries, held in Paris last year, a Paper was read on the above subject, from which we subjoin some extracts. The facts stated relate almost entirely to the conditions which obtain in America, but the main principles are none the less applicable to similar industries in South Africa, now that our fruit exports are advancing so rapidly. In introducing the subject, Mr. Powell gave a mass of details of the enormous horticultural industries of the United States, and then proceeded to deal with the

FACTORS THAT LIE AT THE FOUNDATION OF A WIDER DISTRIBUTION OF HORTICULTURAL PRODUCTS.

The area over which horticultural products can be distributed in sound, wholesome condition has not passed beyond the early stages of practical development. There are two leading factors that lie at the foundation of a wider distribution of perishable products. The first is an improvement in the methods of handling in the fields and packing-houses in order that the keeping quality of the products may not be impaired during the preparation for shipment; the second includes an improvement in the methods of shipment under refrigeration to secure quicker refrigeration of the fruits and vegetables than is accomplished in refrigerator cars, in order to preserve and lengthen their life.

THE RELATION OF THE METHODS OF HANDLING HORTICULTURAL PRODUCTS TO THE EXTENSION OF TRADE.

The losses that occur during the transportation or storage of horticultural products as a result of improper handling in picking and packing are greater than the most experienced growers and shippers realise. The moulds of various kind, such as *Penicillium*, *Mucor*, *Aspergillus*, *Cephalothecium* and *Botrytus*, which may gain entrance to the fruit when the vital processes are at low ebb, but which commonly attack the fruit through a broken part of the skin, cause more losses in storage and in transit than all other diseases combined. These diseases do not have the power of penetrating the skin of a sound healthy fruit. The blue mould rot (*Penicillium*) of citrus fruits has often caused a loss of a million dollars annually in the shipment of the orange and lemon from California. It sometimes causes a loss of 20 per cent. or more in the orange from Florida, and even

greater losses in the orange from Cuba and Porto Rico. The common soft rots (*Penicillium*) of the apple and pear, which develop while in transit or in storage, enter the fruit through stem punctures, nail holes, insect punctures and other types of mechanical abrasion. The common moulds of table grapes from Europe, from California and from the eastern United States usually attack the berries through broken portions in the skin.

The decay (*Botrytus*) of the strawberry, raspberry and other small fruits gains entrance through a bruised or weakened part of the berry, and creeps over it in the form of a cotton-like covering. All of these troubles are largely preventable by handling the fruit with enough care to maintain the natural resistance to these diseases which the fruit possesses when it is growing on the plant or vine.

The Investigations of the Bureau of Plant Industry.

This phase of the discussion may be made more plain by reference to a recent investigation of the Bureau of Plant Industry of the United States Department of Agriculture into the cause of the decay of oranges while in transit from California. It was found that from 5 to 50 per cent. of the oranges were commonly injured mechanically during the picking and packing operations. In warm weather the blue mould begins to grow in these injured spots and causes the fruit to decay before it reaches the market, unless the oranges are quickly refrigerated after picking and packing. The losses from decay while in transit were subjects of dispute between the producer, the shipper and the transportation companies, as the causes of the trouble were not understood. They caused a large loss to the industry; they gave the fruit a bad reputation on the market; and before they were corrected by better methods of handling they prevented the extension of trade in California oranges to the most distant markets.

This phase of fruit handling and its relation to the losses in transportation may be made clearer by reference to the following, taken from Bulletin 123, Bureau of Plant Industry, U.S. Department of Agriculture, "The Decay of Oranges while in Transit from California," 1908.

The following data shows the percentage of oranges injured by the shears or clippers in severing them from the branches by ten pickers working in the same grove: 0·0, 2·9, 4·0, 8·5, 10·5, 13·6, 17·7, 20·5, 21·2, 42·4 per cent. Occasionally pickers have been found who injured from 50 to 75 per cent. of the fruit. The injured fruit is not discovered and is packed for shipment.

The following data shows the variation in the percentage of injury in the fruit of ten growers who delivered and pooled their fruit together in the same packing house: 2·5, 4·2, 8·0, 11·0, 13·6, 14·6, 15·8, 19·3, 24·0, 35·0 per cent. Occasionally a grower has been found whose fruit as a whole showed 75 per cent. of injury produced by the pickers. The amount of injury in the fruit of a grower depends on the character and general supervision of the labour.

The following data shows the variation and the percentage of injury in the oranges found in ten packing houses: 4·2, 5·6, 8·0, 11·0, 12·0, 12·1, 15·0, 15·7, 22·3, 22·7 per cent. A packing house may handle the fruit of a few growers or of several hundred. The amount of injury in the fruit of a house taken as a whole depends on the care with which it looks after the handling of the fruit of its members.

The relation of the care in handling fruit to the development of decay in transit is brought out in the table following, taken from the investigation of 1907.

This table shows the percentage of decay that developed in the series of shipments of oranges under refrigeration while in transit from California to New York. The fruit had been handled in different ways in California

in preparation for shipment. The shipments included duplicate lots of apparently sound oranges that had been brushed to remove the dust, similar oranges that had been washed to remove the dust and sooty fungus, commercially handled oranges washed or brushed which contained more or less fruit injured in handling, and oranges each showing a mechanical injury of some kind, such as a clipper cut, a stem or gravel puncture, or a scratch produced in picking or in the packing house. Duplicate lots of each were shipped as soon as the fruit was packed, and at intervals of two and four days later.

Percentage of decay in oranges handled in different ways and shipped under ice to New York, 1907:

	Decay following immediate shipment and approximate delay of 2 days and 4 days.			
	None.	2 days.	4 days.	Average.
	Per cent.	Per cent.	Per cent.	Per cent.
Brushed fruit, apparently sound	1·2	3·7	6·4	3·8
Washed fruit, apparently sound	2·0	4·2	8·1	4·8
Commercially packed fruit	3·9	8·9	12·6	8·5
Mechanically injured fruit	7·0	18·1	32·4	19·2
Average	3·5	8·7	14·9	

Two important factors are brought out in these data: (1) The decay is least in the sound brushed fruit that is handled the least, and it increases through each series as the handling or mechanical injury increases; (2) the decay increases as the time between packing and shipping increases, the delay in shipping causing the least injury to the soundest fruit and the greatest injury to the mechanically injured oranges. They indicate that some of the difficulties in the handling of perishable produce which have usually been attributed to the conditions in refrigerator cars have their origin in the handling of the produce before it enters the car door, and may be corrected by a proper handling of the produce during its preparation for the market.

The Cooling of Horticultural Produce before Shipment.

The Shipment of Horticultural and Meat Products Contrasted.—Horticultural products are generally loaded in refrigerator cars directly from the field or packing house without previous cooling. The produce may vary from 50 to 110 degrees F. in temperature when loaded in a car, which may or may not have been previously cooled. In this respect, the shipment of horticultural products differs from the shipment of meat, fish, or some of the dairy products. The latter products are generally taken from a cold storage warehouse and are loaded in cars that have already been cooled with a mixture of ice and salt. In the shipment of horticultural products, the fruits and vegetables have to be cooled to a proper degree while in transit in the car. In the shipment of meat, the initial refrigeration is accomplished in a warehouse, and the car has only to maintain the refrigeration during the trip to destination.

It has been practicable to handle meat products in the manner prescribed. The cattle, sheep or swine are usually assembled before they are killed and are shipped from a small number of central points by a com-

paratively few shippers, who frequently own or control the cars and perform the refrigerating service during transportation. The large cold storage houses, in connection with the stock yards, are a part of the system of preservation and distribution of these products.

The conditions surrounding the handling of horticultural products are entirely different. Horticulture is a more precarious business. The shipments are not as certain. They depend more upon the elements and the seasons. The shipping period is not continuous, as it is in the shipment of meat. Fruits and vegetables are grown by a large number of persons scattered over wide areas. In the early days of American horticulture, there were few sections that produced a carload a day during the shipping season. It is only in recent years that 150 cars have been shipped in a single day from a station, or from 500 to several thousand cars from one locality during the season. There naturally grew up in the early days of American horticulture the present system of loading horticultural products directly from the fields and packing house, as it was not practical to build and operate refrigerating plants in which to cool the products before shipment.

This method of shipping horticultural products has a far-reaching influence on the present handling of fruits and vegetables in the field, on their condition on arrival in the market, and on the extent of the area over which they can be distributed in sound condition.

The Cooling of Fruit in a Refrigerator Car.—The ordinary fruit or vegetable refrigerator car is cooled with ice, which is generally placed in bunkers in each end of the car, each holding from three-fourths to one and one-half tons of ice. The produce in the car is cooled by a slow gravity circulation of air, which may fall as low as 35 to 36 degrees F. when it leaves the bunker. The air is warmed by contact with the produce, and, as it ascends to re-enter the bunkers, it acquires more heat. This method of circulation makes the temperature of the air in the top of a car warmer than the bottom, and it is warmer in the centre of a car, if the bunkers are located in the ends.

The cooling of a carload of horticultural produce is comparatively slow. The rapidity of cooling depends on the manner in which the produce is packed, the temperature at which it is loaded, and the temperature of the outside air during the trip. The temperature of the fruit in a carload of oranges loaded in 70 degrees F. may not reach 50 degrees F. until after one-third or one-half of the distance has been covered in a trip across the Continent, while the fruit in the top of the car remains from 4 to 8 degrees warmer than the bottom during the entire trip.

The Effect of Horticultural Practices in General.—As a result of shipping horticultural products directly from the field or packing house, it is necessary to harvest quick ripening fruits like peaches, apricots, plums or cherries, in a green insipid condition, before the flavour is developed on the tree, to protect them against the ripening that takes place while in transit to market. This is especially true of fruit that is in transit several days. It has affected the standing of the fruit from many sections of the United States, giving those regions a reputation of producting fruit of poor flavour and of inferior quality. It causes large quantities of perishable products in the tops of the cars to arrive in market in an overripe and decaying condition. It limits the area over which fruits and vegetables can be distributed, and these products reach an overripe and decaying condition much sooner than similar products that have been refrigerated quickly after picking and packing. It limits the freight carrying capacity of a refrigerator car, the minimum freight rate being determined by the height to which the produce may be safely loaded without danger of excessive loss in the top tier of packages, not by the

actual capacity of the car. A car of horticultural produce is not often loaded over two-thirds to three-fourths full.

The Investigations of the Bureau of Plant Industry

As a means of assisting the producer, the shipper, and the transportation companies in determining the factors that govern the distribution of fruits and vegetables over wide areas, the Bureau of Plant Industry of the United States Department of Agriculture has been investigating the temperature of produce of different kinds in refrigerator cars, the produce having been shipped under different methods of refrigeration; and also the carrying quality of produce that has been handled in different ways before shipment when forwarded under different methods of refrigeration.

Special examples taken from these investigations (Bulletin 123) are presented to make more clear some of the questions stated in the preceding discussion. Temperature records are shown of carloads of oranges shipped under the regular method of icing from California to Jersey City, N.J. The distance covered in the trip is 3,000 miles. The records show the changes in temperature in the fruit, in the air in the cars, and in the outside air during the trip.

Records also show the average cooling of oranges in the top and bottom tiers of packages in a series of shipments in refrigerator cars under regular icing from California to Jersey City in 1907.

These, in substance, show that the fruit is not reduced to a low temperature until after a considerable part of the transcontinental trip had been covered; and that the fall in temperature in the top of the car lags behind the bottom throughout the trip.

Other records give the temperature changes in cars of oranges shipped from California to Jersey City, N.J. The fruit was cooled to a temperature of about 40 degrees F. in a cold storage plant, and was loaded in cars previously cooled with ice. The cars were re-iced regularly six or eight times in transit. One record is that of a car loaded with 549 boxes of oranges. Another is that of a car loaded with the standard load of 384 boxes. A box of oranges weighs 72 lbs. The heavier load is made possible by cooling the fruit before shipment and by the closer and higher loading of the boxes in the car. The temperature of the fruit in both records remained fairly constant throughout the trip. Under these conditions, the ripening of the fruit and the development of decay are retarded to the greatest extent.

Two of the records give the temperature changes in cars of oranges shipped from California to Jersey City, N.J. The fruit was cooled before shipment, and was loaded in refrigerator cars previously iced. The cars were re-iced once before leaving California, but were not re-iced during the trip of 3,000 miles, under these conditions the temperature of the fruit did not begin to rise perceptibly until one-half of the transcontinental trip (or about 1,500 miles) had been covered. These records indicate that produce properly cooled before shipment may be forwarded great distances in sound condition without icing, except the initial icing of the bunkers of the car. The need of re-icing in transit depends on the temperature of the air during the trip.

The effect of cooling fruit before shipments in retarding the development of decay is brought out in the following table. This table shows the development of decay in a series of shipments of oranges from California to New York in 1907. The oranges had been cooled to a temperature of about 40 degrees F. before shipment. There were included in each shipment oranges that had been handled in different ways in California, and duplicate shipments were forwarded in which the fruit was cooled as soon as it was packed, and after a delay of two and four days after packing.

Percentage of Decay in pre-cooled Oranges, 1907.

Treatment of condition of Fruit.	Delay following immediate cooling after packing, and a delay of 2 days and 4 days.			
	None.	2 days.	4 days.	Average.
	Per cent.	Per cent.	Per cent.	Average.
Brushed fruit, apparently sound	0·1	2·3	3·4	1·9
Washed fruit, apparently sound	0·8	2·3	5·5	2·9
Commercially packed fruit	2·2	6·2	9·1	5·8
Mechanically injured fruit	3·0	9·2	13·9	8·1
Average	1·5	5·0	8·0	

These data indicate (1) that the least decay develops in the sound brushed oranges; that more decay develops in the washed oranges which are handled under conditions more favourable for the growth of the rot; that still more decay developed in the commercially handled oranges which contained more or less fruit injured in handling and which had been eliminated from the two preceding lots; while the greatest amount of decay developed in the oranges all of which were injured mechanically in picking or packing. They show (2) that it is essential to cool the fruit quickly after picking and packing if it is to be cooled before shipment in order to prevent the starting of decay during the interval between packing and cooling; and (3) that the decay, on the whole, in the pre-cooled fruit is less than in the fruit shipped under regular icing.

The Practical Side of Cooling Produce for Transportation.

There have been sufficient data presented in the preceding discussion to indicate the possibility of extending the markets in horticultural products. There is abundant evidence to show that a careful preparation of the fruit for market, together with cooling to about 40 degrees F., quickly after picking and packing, would more than double the area over which fruits such as the peach, apricot, cherry and the small fruits are now distributed.

The question naturally arises, is it practical to modify the present methods of handling and of shipping horticultural products under refrigeration From the standpoint of the handling of produce, it can be said that a gradual improvement is taking place in this regard all over the United States. It is a question of business management, of the handling of labour, of better appliances for the handling of fruits and vegetables in the fields and packing houses, and of a knowledge of the relation of the care with which they are handled to the development of diseases.

From the standpoint of refrigeration in transportation, the problem is more complicated and has not yet passed the experimental stage. Stated broadly, the cooling of large volumes of horticultural produce requires that each shipper or an association of shippers, or some agency such as a transportation or warehouse company acting for them, shall erect cooling plants at shipping stations or at assembling points where the products may be properly cooled before shipment. The cooling may be done in a warehouse, or, if practicable, after the produce is loaded for shipment by circulating cold air through the cars.

Following the experimental investigations of the Bureau of Plant Industry along these lines, a number of plants have been erected by shippers and associations of shippers in different parts of the United States, a number of patents have been issued within two years covering devices designed to accomplish the rapid refrigeration of produce in cars or in warehouses; and the question is receiving consideration by railroads, especially by those that transport the fruits and vegetables from the western part of the United States.

In California, large volumes of produce are shipped daily during the season from single sections or from stations in close proximity, and there are a few assembling points in the State where the cars are made up in trains for shipment from the State. The question suggested under such conditions is the practicability of cooling train loads of produce by circulating cold air through the cars at the large shipping stations or assembling points, without interfering unduly with traffic. To the solution of this problem, the Southern Pacific Co. and the Santa Fe System are giving experimental consideration.

Another problem which is suggested in sections where a number of shippers are closely located is the practicability of delivering the refrigerant from a central plant to cooling rooms located in each packing house.

New Problems Involved in Cooling of Produce for Transportation.

A proposed improvement in the transportation of horticultural produce under refrigeration requires consideration from many sides. It involves new problems in engineering and refrigeration, such as the equipment of plants that are capable of the rapid and economical cooling of products, the uniform distribution of air through the cars when the cooling is done by air circulation as well as the practicability of such a system, and the advisability of erecting plants for shippers that are to be operated only during a short period of the year. It involves new questions in plant physiology and chemistry, such as the influence of the rapid cooling on the life processes of fruits and vegetables, the degree of cold that different products can withstand without injury; and the effect of cooling the produce with temperatures below the freezing point while the produce is warm and of raising the temperature gradually as the products approach the desired degrees of cold. From the transportation standpoint, it has a bearing on rates of refrigeration, freight rates and schedules, of the degree of responsibility for the condition of the produce when the pre-cooling and the refrigeration in transit are done either by the shipper or the transportation company, and of a large problem of the responsibility of the railroads in handling highly perishable crops in an expeditious manner.

No one who has considered the tendencies in the development of commercial horticulture, and the evolution of the methods of transportation during the last quarter of a century can doubt that both the methods of handling the products and of transportation will continue to improve as the industry expands. No one can doubt that commercial horticulture will rapidly expand, both in the areas of production and of distribution, when the most careful handling is applied in the preparation of the products for shipment and when the methods of refrigeration make it possible to distribute them in a sound, wholesome condition to the most distant markets of the world.

DRY ROT OF THE POTATO.

STEM-END ROT, WHITE ROT, WINTER ROT (*NECTRIA SOLANI*).

(By CHAS. P. LOUNSBURY, Government Entomologist).

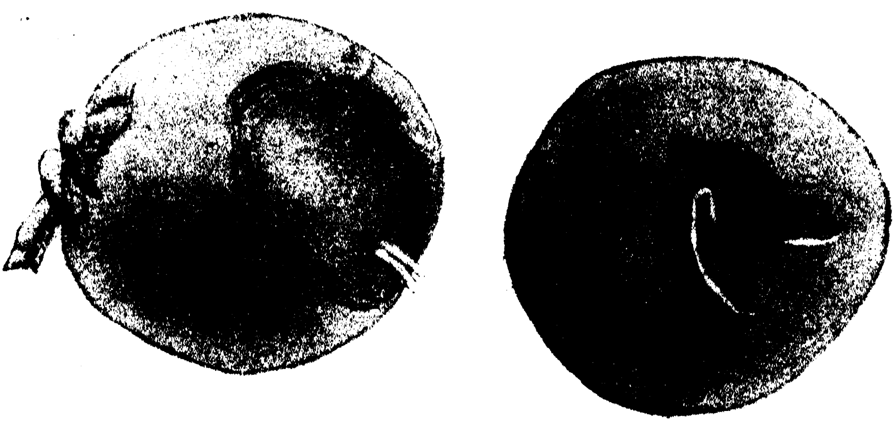
The Dry Rot is not a new disease in the Cape Colony, but an old one that has been forced into prominence during the past year by the action of the Transvaal Department of Agriculture in refusing to admit for consumption or planting in its territory any consignment of potatoes in which the disease is evident in one per cent. of the tubers. The Transvaal usually designates the trouble as *Nectria solani*, this being the botanical name of the mature stage of the fungus which is assumed to give rise to the decay. As will be explained, it is possible that one or more other fungi may give rise to a decay of potato tubers that cannot readily be separated from that produced by *Nectria solani*; and, as it is probable that they are of approximately equal importance and infectiousness, and as the Transvaal authorities do not differentiate them in practice, it seems advisable to treat of them, for present purposes, under the commonly accepted popular name that covers all—"Dry Rot."

The name, "stem-end rot," is even more significant, and "stem-end dry rot" is better yet. The terms "white rot" and "winter rot," however, are not suggestive of the trouble to the Cape farmer, and are given in the title to this article only because they are used in accounts to which reference will be made. The present account is not to record any new observation in regard to the trouble, and the writer disclaims any desire to pose as an authority on the subject. He has merely composed this account for the information of Cape farmers and Cape shippers of potatoes to the Transvaal, many of whom have made inquiries on the matter owing to the rejection by the Transvaal of consignments in which they were interested.

NATURE OF THE DISEASE.

Dry rot is generally recognised only as a disease of the tuber, and it is not generally observed until the tubers have been stored for several weeks. Few Cape farmers suspect its infectious nature and, as a rule, it is attributed to some soil or seasonal peculiarity. Often the affected tubers are thought to have developed near the surface and to have been affected by the heat of the sun. The infection is introduced into the soil with diseased tubers and it remains there from season to season, so that a crop from perfectly healthy seed may get infected if grown on land that previously bore an affected crop. The disease generally enters at the stem end. The fungus develops most rapidly in the "vascular ring," the narrow water-coloured line seen about a sixth of an inch from the outside when a potato is cut across. The ring turns brown in spots and streaks in advance of the main body of the decay. When the potatoes are dug there may be no pronounced external indications of the trouble, and the owner may dispose of a crop, and the crop subsequently pass through a succession of hands and ultimately be consumed without anyone suspecting that it was not entirely sound; and yet if it were stored under conditions favourable to the development of the fungus, this crop might prove grossly infected and waste away rapidly. The fungus ordinarily enters at the stem end when the tuber is in the soil, often it is said when the tuber is

very young, and hence the decay ordinarily begins at the withered stem. A small depressed spot forms there, due to the shrinkage and discolouration of the tissue beneath, and as the disease progresses inwardly the shrivelled area becomes larger and larger until the entire surface is involved. The inside, meanwhile, normally becomes discoloured, and quite dry and hard. Quite commonly other fungi, and also bacteria, invade potatoes which have begun to decay with dry rot, and mites and other forms of animal life come to feast in the decaying parts. These various agencies may hasten the decomposition, disguise the true source of the trouble, and alter the superficial appearances, the potatoes, sometimes, becoming soft and putrid. Warmth seems to be the chief factor necessary for the development of the disease, and it develops readily in potatoes stored on the dry lofts of Cape farmhouses and outbuildings. But warmth and moisture together, in an ill-ventilated place, cause much more rapid development, and while in a dry atmosphere the shrivelled skin of the tuber generally remains practically free of fungous growth, in a moist one it becomes more or less coated with conspicuous, raised, white patches of spores, the fruit bodies of the fungus. The Trans-



DRY ROT.—Slightly affected potatoes. Notice that decay is from the stem end. Potato on left is sprouting. Tubers like these should not be planted.

vaal Plant Pathologist states that "each white tuft is composed of millions of germs or spores," and that "one diseased tuber is quite sufficient to contaminate its neighbours in the same box or sack."

PROBABLE IDENTITY OF DRY ROTS OF DIFFERENT COUNTRIES.

Dry rot of the character described is known in Europe, North and South America, Australasia, and South Africa, but while it is probable that the fungus causing it is, in most if not all cases, of one particular species, it is ascribed to fungi under a number of different names. The name *Nectria solani* is now generally recognised as the proper designation for the fungus associated with the trouble in Europe. But until a few years ago the same fungus was unknown in its perfect stage, and then went under the name of *Fusarium solani* or *Fusisporium solani*. As great quantities of seed potatoes have come into South Africa from Europe, it is only reasonable to suppose that the common dry rot here is identical with the one there. That the fungus present in diseased Colonial-grown tubers is a kind of *Fusarium* was not difficult to prove, and this opinion was confirmed in March last by Mr. W. T. Saxton, of South African

College. The opinion of the Transvaal Plant Pathologist on the matter has proved difficult to get, but under date of May 26th, he wrote:—

> ". . . . . I beg to inform you that I regard the fungus in the trouble described by you as Cape dry rot to be *Fusarium solani* Sacc. The conidial stage—which is all I have seen at present in the samples forwarded by you—may, of course, be that of *Nectria solani*, but I would not pronounce it to be *Nectria solani* without further evidence. We treat both *Fusarium solani* and *Nectria* alike for inspection purposes."

In the United States and Australasia, the fungus associated with dry rot is given as *Fusarium oxysporum*. The United States Bureau of Plant Industry has published two important papers in regard to it, but it has not yet definitely committed itself to a statement that *F. oxysporum* is identical with *N. solani*. Under date of April 14th last, the Chief of the Bureau, *inter alia*, wrote:—

> "We do not recognise *Nectria solani* as the cause of a potato disease in America. *Fusarium oxysporum* . . . . . is more or less prevalent." . . . . ."

The authorities of the British Board of Agriculture are less conservative on the matter, and in a letter, dated May 8th last, wrote:—

> ". . . . . *Fusarium solani*, as known in England, is the same as *Fusarium solani* as known on the Continent, while *F. oxysporum* is only another name for the same thing, which is a conidial condition of *Nectria solani*, which latter is the ascigerous condition of this fungus."

That the American dry rot is probably identical with the common European dry rot is strongly indicated by the importation of enormous quantities of European potatoes both for consumption and for seed, in some years. Many thousand of tons, chiefly of medium-class produce, were sent over from Great Britain last season, and a recent American report states that in the first three months of the present year over a million bags of foreign potatoes were landed at New York.

The dry rot of potatoes known in Argentina, is put down to *Fusarium solani*. That of New Zealand is credited to *F. oxysporum*; and the 1906 annual report of the New Zealand Department of Agriculture cautions farmers against infection of this fungus in Australian-grown potatoes, several importations of which had been observed by the Government Inspector to be diseased in this manner.

Effect on Growing Plants.

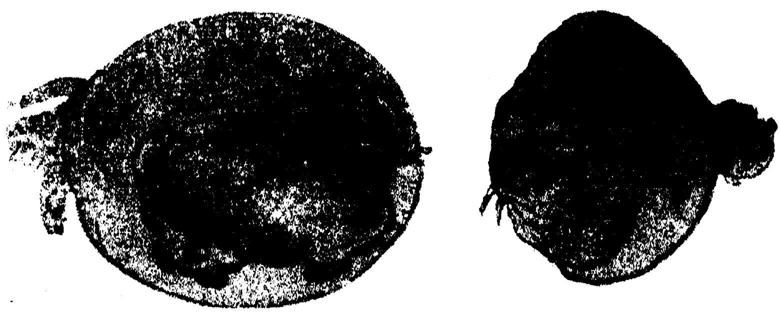
The potato growers around Cape Town do not connect dry rot with any disease of the potato plant apart from the tubers, and do not appear to have observed damage to the roots, and indirectly to the tops, such as has been shown to be caused by the *F. oxysporum* fungus. The disease in the plant has the descriptive name "potato wilt." The following account of its characteristics is given in Circular 23 of the United States Bureau of Plant Industry:—

> "The disease first becomes noticeable when the plants are about a foot high, though in mild cases it may not appear till near maturity. The leaves have a lighter green colour, and slowly assume a dull, unhealthy appearance, with a rolling or curling of the margins. The progress of the disease is slow. Gradually the tops wither or fall over and the general effect is premature ripening. The diseased plants are easily pulled up; the roots are partly dead and brittle. The wilt fungus frequently appears on them as a

white or pink mould, and when the underground portion of the stem is cut across, a pronounced brown discolouration is visible. This brown stain is also found in the branches leading to the tubers, and a thin slice across the stem end of the tuber will often reveal its presence there as well. . . . . The yield from diseased hills is greatly diminished, particularly if the attack begins early in the season. When the tubers are dug there is rarely any external evidence of the disease on them. The major portion of the crop produced from wilted plants is nevertheless infected, the fungus having entered the tubers through their stems."

It is quite probable that the disease described is common in the Colony, but that the unthrifty condition of the plants is either not noticed or else is attributed to drought, insect injury, or other innocent circumstance. The Transvaal Plant Pathologist evidently has observed it, for in the 1905-1906 Annual Report of his Department of Agriculture, under the heading "Wilt, *Fusarium oxysporum*," he states:—

"This disease, which first produces a sudden wilting of the vines, has appeared among several potato crops in the Pretoria district."



DRY ROT.—Decay more extensive than in first figure. Both Potatoes are sprouting. One on right is half wasted away, but as it had been kept in dry place no white fungus shows on surface.

DISTRIBUTION OF DRY ROT.

The fungus responsible for dry rot was described in Germany in 1824, and in view of the extreme prevalence of the trouble in Europe, the facility with which it may be introduced with seed potatoes and the world-wide use of European-grown seed, it is inconceivable that it has not long since found its way into practically every country enjoying a potato trade with others. Though generally considered amongst the least important of their troubles, potato growers in the vicinity of Cape Town all seem to have it on their farms, and many potatoes from the Caledon and Robertson districts sold on the Cape Town markets have been noticed to be slightly affected. Similarly, infected potatoes from Cathcart and other districts of the eastern part of the Colony have been observed on the market at East London. Not only is the disease of common occurrence, but it seems one which has been known to observant farmers for many years, in some cases for fully forty. One well-known Eastern Province farmer who has planted as high as 1,700 bags of seed potatoes in a season, in reply to questions, wrote:—

"We have had the trouble as far back as I can remember, say about thirty years. It is, so far as I know, universally distributed. It has been known all over these districts for the above-named period, probably much longer. I attach little or no importance to it."

It is of course inconceivable that the Cape Colony has such a disease and not the northern colonies, which have depended largely on the same sources for seed. And hence it is not surprising that the Transvaal inspectors find reason to condemn many Natal and Orange River Colony potatoes.

British-grown seed has the reputation of being cleaner than French or German seed, yet treating of the disease in Great Britain, Leaflet 193 of the British Board of Agriculture states:—

> "This fungus is one of the commonest diseases of the potato. It attacks stored potatoes, and is always present to some extent, but usually only reaches the proportion of an epidemic during hot, dry seasons, which favour the rapid development and spread of the fungus. The tubers only are attacked, and inoculation, by spores present in the soil, takes place when the tubers are young; but, as a rule, the disease is not obvious when the tubers are lifted, although the mycelium of the fungus is present in the tissues. The further extension of the disease depends entirely on circumstances. If the potatoes are kept dry and exposed to the air no further development takes place. On the other hand, if they are stored or placed in heaps so that air is practically excluded, and more especially if stored before being perfectly dry, sweating takes place, the temperature is raised, and within a few weeks the mycelium present in the tubers commences growth."

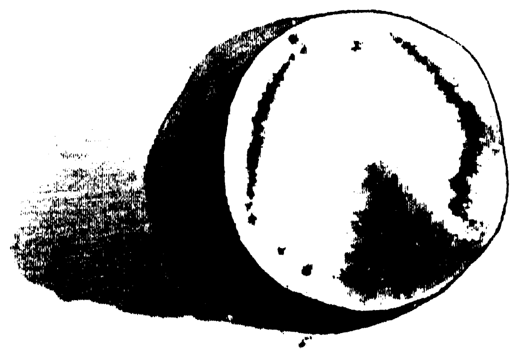
Dry Rot in Imported Seed.

Enough has been said to explain why dry rot is often prevalent in imported European seed potatoes. They have to come through the tropics and may experience an exceedingly hot and humid passage, thus developing rapidly any latent infection that may be in them. Without doubt, proper care is not always exercised in the selection of the seed on the European side; but the bulk of the potato seed trade between Europe and the Cape seems to be done by firms who have had long, practical experience in handling and shipping potatoes, and who in their own as well as their customers' interests give careful attention to the growing and sorting of the seed which they ship through the tropics. Many ship under their own names or trade marks, which become well known to the ultimate buyers of the produce, and as business men they fully realise that their continued success in the trade depends on their shipments arriving in satisfactory condition. Dry rot is one of the several troubles that give them anxiety, and as it is impracticable to detect all infection from the outside of the potatoes, they are not able to exclude from their shipments all tubers which are liable to develop the trouble on the long voyage to South Africa. However, it seems safe to assume that they are truthful in stating that they do all that is commercially practicable. It is the writer's belief that if South African seed potatoes were sent to Europe they would arrive, on the average, vastly more diseased with dry rot than do European seed potatoes which are sent here. Altogether, the problem before the Government in regard to the disease is not, properly, one of regulations to check the introduction and spread of infection, but that of educating the farmer to a knowledge of the nature of the trouble and of teaching him how to avoid loss by it.

Importance of the Disease.

Dry rot is chiefly of importance to the Cape potato-grower at the present time because the Transvaal authorities reject any consignment in which one per cent. of the tubers is infected, and many potato growers are wholly incredulous to its having any further material importance than

this. Nevertheless the disease is one against which every potato grower should take precautions, for it is one which may cause very serious loss, perhaps loss by a heavy diminution of crop which would be entirely attributed to unavoidable causes or even overlooked by one ignorant of the nature of the disease. Recently the United States Department of Agriculture investigated the failure of potatoes to grow thriftily in certain very rich valley soil in California. It was said that when such land was first cleared and put under potatoes the yield might be as high as 800 bushels (270 bags) of good tubers an acre; but that after two or three seasons it no longer paid to grow potatoes, so poor in quantity and quality did the yield become. The principal cause of the decline was found to be this dry rot fungus. A few farmers near Cape Town have acknowledged occasional losses of thirty or more per cent. in long-stored potatoes, but most that have been questioned by or for the writer have said they thought it was on the average under one per cent. of the yield. The writer's impression, however, is that the loss must be far greater than this, inasmuch



DRY ROT.—Tuber cut across below decay to show the characteristic discoloured ring.

as farmers commonly recognise that potatoes grown under certain conditions would keep badly on account of the trouble and must therefore be sold early for what they then bring, and because the yield, in the light of American investigations, must be lighter than it would be without the disease.

The losses would undoubtedly be far greater than they now are were it not that farmers generally exercise precautions that tend to keep the disease down. The infection, as already stated, lives over in the soil, and hence to have potatoes directly follow potatoes for a succession of years would soon bring about the general infection of the crop if the disease got in. But, without knowing the precise reasons why, most farmers are well aware that it is inadvisable to grow successive crops of potatoes on the same land, and they avoid doing so as a matter of course. Certain local exceptions should, perhaps, be mentioned. Some farmers near Cape Town who make a speciality of potatoes feel obliged to put part of their land in this crop for two or more consecutive years, but in the winter interval between the crops it is their practice to grow barley. It is probable that the short interval in barley diminishes the extent of the infection, but the farmers know that the potatoes from the land are apt to keep badly, and hence they dispose of them quickly. A second exception is the case of vlei lands which are kept flooded with water during the winter. Some such lands near Cape Town are said to have been cropped with potatoes only for upwards of half a century. They remain covered with water about from June to November, and enjoy the reputation of yielding crops which remain wholly free of dry rot no matter how long they are kept.

Naturally potatoes from these lands are in strong demand for planting elsewhere. Some vleis do not get completely covered with water, and it is said that the parts which remain dry yield potatoes of inferior keeping quality. The writer recently examined stored potatoes grown on such a vlei. Those said to be from the winter-submerged part appeared entirely free of dry rot, while there were numerous affected ones amongst those said to have come from the dry part. The other conditions were said to be the same.

Another precaution which many potato farmers exercise is the rejection of diseased seed tubers or at least the diseased parts of tubers, and many seem to do this while quite unaware that the action has any bearing on the prevalence of dry rot. Some farmers say that they notice little or no difference when they leave in the affected tubers, but they would probably find the difference a substantial one if they took special care to watch for it. Still there is no reason to suppose that some kind of a crop may not be raised from badly diseased seed, and such a crop may yield a good return if marketed at once. Much, however, may depend on the time of year and the seasonal conditions. The Eastern Province farmer alluded to above, wrote:—

> "We do not attach much importance to dry rot, as it is always more or less in evidence, though it is worse in some seasons, both in the growing stage and when stored. One season I cut off about 20 bags of dry rot ends. I should say there were about 2,000 pounds of the cut-off ends, and being short of seed, I gave the 20 bags to a tenant to plant. He got an excellent crop with little or no damaged ones."

If the tenant had stored his crop for long, he might have found its excellence of short duration, and it is to be hoped that he did not put potatoes on the same land until after several years.

In a recent letter, the Chief of the United States Bureau of Plant Industry stated:—

> "In our Western States *Fusarium oxysporum* is more common (than in the Eastern) and operates to limit the potato production in many of the interior irrigated valleys. Even here losses are readily avoided by the adoption of a suitable rotation, providing for an interval of two or more years of alfalfa (lucerne) or grain between potato crops."

Prevention of Dry Rot.

The chief measures for minimising loss by dry rot have already been intimated, but may with advantage be summarized:—

1. Rotate potatoes with other crops, avoiding tomatoes and others closely allied botanically to the potato. If practicable have three or more years elapse before potatoes are again planted in soil from which an infected crop was taken. Barley and other grains, lucerne, beans, and other common vegetables are suggested as suitable by the U.S. Bureau of Plant Industry. It is not known how long infection can survive in the soil.
2. Use perfectly healthy seed. If affected seed must be used, at least reject the diseased part, cutting below any discolouration.
3. Burn or deeply bury diseased tubers. If wanted for feeding to stock, boil them. Avoid getting any into manure.
4. Store suspected potatoes in dry, cool, well-ventilated places, if at all. The American investigations referred to above state that cold storage (40° F. and less) prevents development of the fungus almost entirely.

THE DRIED FRUIT AND RAISIN INDUSTRY.

Report by Mr. P. J. Cillie, C.son.

Mr. P. J. Cillie, C.son, commissioned by the Secretary for Agriculture to visit certain districts during the fruit and grape season and to impart information as to the best methods of drying fruit and preparing raisins, as well as to advise farmers as to the planting of suitable species, for which in his opinion there exists not only a first-class demand in the various markets of our country, but which also offer the best prospects of success in the districts, visited by him, writing from "Vruchtbaar," reports to the Secretary for Agriculture that he started the work entrusted to him at the latter end of November, by holding meetings in the following centres: Worcester, Robertson, Montagu, Ladismith, and Frenchhoek. The report proceeds: To the Resident Magistrates, who had been requested by your office to notify these meetings, all honour is due for the lively interest shown by them, and for the assistance given by them in order to make my work a success as far as was in their power. To a great extent it is due to them that the meetings were not only well attended but were representative of the various wards of each district.

At the meetings the arrangement of further business was discussed, and in some cases left in the hands of the committees of the local Agricultural Society or Fruitgrowers' Associations, and in other cases in the hands of small committees, consisting of two or three interested people in the various wards of the district, with whom to correspond later on, and to make arrangements for further visits.

These small committees answered exceedingly well; for, although this arrangement gave extra correspondence, it put me in direct contact with those who wanted my assistance and kept me posted as to the time when such assistance was required. It was often a pleasure to me to see what sacrifices more than one submitted to for the sake of the welfare of his ward and neighbourhood.

Should the work be continued in the next season, I would recommend the preliminary meetings not only to be held in the principal villages, but also in the different wards in any district interested in the fruit and raisin industry; and that in every ward two or three interested parties be requested to take in hand the arrangement of business and the carrying out of it during the season; that would facilitate the work and render it more efficient.

From the produce buyers also I experienced co-operation and assistance, which was of great use in my work. They gave me—without exception whenever I approached them—every information with reference to quantities, qualities, cost prices and selling prices, and every opportunity of getting an insight in the trade in those lines, which was to me of great value and of which I could often make use without misusing the confidence put in me, or betraying trade secrets.

With satisfaction I found, from facts placed before me, that the ancient system in the produce trade of *one price paid* for all qualities whatever, had, almost without exception, made room for the system of *price according to quality*; and that the prices paid for the improved product were much higher proportionally than all expenses of labour spent in those improvements.

Notwithstanding the fact that I have been convinced for a long time that the demand for the best classes of dried fruit and raisins is increasing, I must frankly confess that only now I really know and begin to realise how large that demand is, and what prospects there are of finding ready buyers and consumers of carefully prepared products at prices which will pay the producers exceedingly well. On the other hand I found only too often that with carelessly prepared products the merchants in those articles experienced the utmost difficulty in disposing of them at any price.

One of the greatest difficulties experienced by me was that, however willingly my advice was followed, too often the proper means of applying it was not at hand; and sometimes I had to make use of the most primitive contrivances in order to attain my end, viz., that of practically demonstrating in what way, by more care, cleanliness and small improvements here and there, a much improved article might be produced. On my visits I have often found that by suggesting small improvements in a very simple way, or by showing it by example, I opened the way for great progress at later stages, and I had often the opportunity of discovering how a small improvement spread from neighbour to neighbour and was imitated, and how such is the sure way of attaining my end in the improvement of the finished product.

That there should be some who would be deaf to all advice—however well-intended it might be—and would continue their work in their own way, was of course to be expected. Generallv, however, the work was highly appreciated, and I am perfectly satisfied that it is a very necessary work, which not only ought to be continued but also extended in future.

There have been cases where indifference and negligence have played a prominent part and where it was labour lost endeavouring to find admission for new methods; but fortunately those were only exceptions. That, however, great ignorance in respect of the progress in the province of fruit culture in general, and of the preparing of the finished aticle in particular, is responsible for the state of affairs, as is only too often found, is undoubtedly certain; hence an article was produced which could not possibly compete with the imported one, and that we were excluded from our own markets.

Unfortunately it is exceedingly difficult to spread knowledge regarding these matters among those living in remote places; therefore that state of affairs can only be improved by personal contact and by practical demonstration of what we ourselves may be able to do in the way of producing, as to quantity as well as to quality, raisins, sultanas, currants and dried fruit, not only to provide all South African markets—however much they may be extended—but also the world-markets. And that we will be able to do that, if we tackle this industry in the right way and with courage and perseverance, there is no need to doubt.

In my opinion the districts of Worcester, Robertson and Montagu have an undeveloped gold mine in their prospects of establishing an enormous and extra paying raisin, sultana and currant industry. I hope that the little I was able to do may also tend to the improvement and advancement of the Colonial-made article.

AGRICULTURAL ZOOLOGY FOR SOUTH AFRICAN STUDENTS.

BEING A COURSE OF LECTURES ON AGRICULTURAL ZOOLOGY, DELIVERED BY DR. J. D. F. GILCHRIST, PROFESSOR OF ZOOLOGY AT THE SOUTH AFRICAN COLLEGE, IN CONNECTION WITH THE TECHNICAL EVENING CLASSES INAUGURATED BY THE SCHOOL BOARD OF THE CAPE DIVISION.

INTRODUCTION.

Zoology is the science of animal life, or, in other words, the accurate and proved knowledge of the structure of the animal body, its functions or activities, the general habits and behaviour of animals, together with their origin and relationships. As a study for the development of accuracy of observation and the drawing of justifiable deductions from observed facts, as well as from the point of view of general enlightenment, its advantages are now well known and recognised in all educational systems. An elementary knowledge of the subject is required in the training of the physician as a basis for the more detailed study of his profession, and it is becoming more and more apparent that it is as useful in the training of the agriculturist, as a basis or general introduction to the more specialised subjects, such as veterinary science or economic entomology.

Of recent years it has been found that it is to the study of Zoology that we must look for the only sound methods for the treatment of many practical questions. It is not only the more familiar zoological facts or the outstanding features of animal life that are of this practical importance, but many of the most obscure, indeed the requirements of practical work have here already outrun the attainments of science. We have not, for instance, a microscope powerful enough to detect certain very minute animals, which, there is reason to believe, are the causes of certain diseases; again, the actual factors which would account for the origin of species and variations of animals are little known or understood, though such knowledge would be of the utmost practical utility, as, for instance, in the breeding of animals of a desired type. The advance of well-founded knowledge, or science, if one prefer the name, has of late years been comparatively very rapid, owing to the fact that it has become an important factor in practical life, though this rapid progress has been accompanied by a growing realisation of how little, in a sense, the advance has been. A few years ago it might have been thought too theoretical or scientific to have devoted any attention to minute and obscure forms of animal life in economic zoology, but the commencement of even an elementary study of the subject in this way hardly now calls for an explanation far less an apology.

Protoplasm, Plants and Animals.

Living substance is apparently readily distinguishable from dead substance, but, when we attempt to specify the exact difference, we meet with some difficulty, and we meet another when we attempt to state precisely the difference between the two chief kinds of living substance, viz., vegetable and animal life. (The study of living substance both plant and animal life is called Biology, the study of plant life Botany, and the study of animal life Zoology). We might say that, among other things, living substance differs from dead substance in that it is capable of feeding on, or assimilating into itself, dead substances, and of throwing out or excreting the waste products. If the rate of assimilation exceeds that of excretion the animal or plant grows, and they may give rise to progeny like themselves—a form of growth. This, speaking generally, is as near a definition of living matter as can at present be made. A closer examination of living substance (called Protoplasm) shows that in both animals and plants it is of a more or less fluid nature, and is composed of well known chemical elements, such as carbon, oxygen, nitrogen, etc., but how exactly these are combined in the living state is not known. We know, however, that this combination is a very unstable one and is readily broken down. Not only so, but what stability or permanence it has is dependent on a constant chemical change; it must be continually supplied with oxygen, which combines with its other elements. Such a process of oxidation is more familiarly called burning, and the stability of living matter has been compared to that of a flame of constant form but ever changing substance. This process of burning requires, of course, a constant supply of fuel, or food, and it is in the nature of the fuel which can be utilised that animal life differs from plant life. Plants are able, with the aid of chlorophyll (the green of plants, a substance closely allied to protoplasm) and in the presence of sunlight to combine carbonic acid and other gasses, with simple chemical elements in solution, into more complex compounds and build these up into protoplasm. These more complex substances are allied to protoplasm in their constitution, and are known as organic substances. Animals, on the other hand, cannot utilise the simple elements, but only the more complex, so that animal life is entirely dependent on vegetable life, and perhaps came second in point of time. A further difference between plants and animals is that, while plants can only feed on gasses and solutions, animals are able to feed on solid matter.

How protoplasm first arose from dead inorganic matter is only a matter of conjecture. Many attempts have been made to produce it artificially in the laboratory, but hitherto in vain. The nearest approach to success is in the making of some organic compounds, *e.g.*, by passing an electric discharge through water vapour charged with carbonic acid gas—conditions which may readily have occurred in the previous history of the world. In spite of the most diligent search, there is no evidence, however, that living substance, even in its simplest and minutest form, now appears anywhere spontaneously, *i.e.*, from dead substance. The naturalist, as well as the agriculturist, is frequently surprised by the sudden appearance of animal life in vast numbers—in the form, for instance, of plagues of insects, mice, etc., but he may now rest assured that this is not due to spontaneous generation as has been often supposed, but that the cause is to be discovered and counteracted only by patient and often laborious investigation into the habits and structure of animals.

There is one characteristic of protoplasm which we must note, as it is one of the most important features in all the varied forms of animal as well as vegetable life, and one which the student should be made acquainted with at the outset of his studies. It had been observed as early as the 17th century that vegetable tissue, such as cork, for example,

is made up of a great number of minute chambers or cells, and it was subsequently ascertained that these are, or were, filled with living protoplasm. The cell walls themselves are indeed formed by this protoplasm. Later on it was found that the animal body also was built up of small masses of protoplasm, and the name "cell" was retained as a convenient term for these protoplasmic units. As to why protoplasm should always occur in the form of small units it has been suggested that a certain amount of absorbing surface is necessary for the life of the protoplasm, and this surface would be too little in a large mass whose surface is of course proportionately small. The explanation may, however, lie deeper; it is now believed that the essential element of the cell is, not the wall nor the protoplasm, but a small denser part of the protoplasm, called the nucleus. There is usually one nucleus in each cell. The size of the cell may have something to do with the range of the controlling influence of this nucleus, which, at any rate, plays a very important part in the life of the animal, especially in the reproductive processes.

All the tissues and organs of the body—skin, muscle, nerve and even bone—are thus made up of innumerable cells or units of living substance, and each kind is specialised to perform its own definite functions. It requires of course special methods to show that the body is made up of cells, but certain loose cells may readily be seen under the microscope, for instance, those which float freely in the blood, or some may be scraped from the inside of the cheek by a blunt instrument, for the surface of the body is constantly giving off dead cells. In some animals, such as the frog, these are shed at one time; the skin, which is thus "cast," will readily be seen on microscopic examination to be composed of cells.

These specialized cells are combined together to form the various organs of the body, and it is necessary, before beginning a systematic study of the various groups of animals, to have an elementary knowledge of the general structure and position of such organs (Anatomy), their minute structure, or nature of their constituent cells (Histology), and the functions or work done by them (Physiology), as well as how they arise from the egg (Embryology). The structure of the higher animals is so uniform that almost any familiar and easily procurable type may be selected for examination, *e.g.*, the frog, pigeon, rabbit, sheep or ox. It is very essential that a practical examination by dissection should be made, and the frog has been found the most convenient type for this purpose; if we are familiar with the general features of this form, we will readily be able to understand descriptions of others. The following details should be made out by practical examination and dissection of specimens of the frog with comparison of other types when possible.

I.—General Structure of Animals, as Illustrated by the Frog and other Types.

(1) *External Characters.*

Note the *smooth, moist skin*, and compare it with the scaly skin of fishes and reptiles. There are no hairs or claws—(though in one South African frog, Xenopus laevis, there are claws on the hind toes). The *head* is flat and triangular, and there is no neck. The eyes are large and have two *eyelids*, the lower of which is freely movable and semitransparent. (Compare the eye of the bird in which there is a third membranous eyelid.) Behind the eye is a dark circular patch; this is the drum of the ear, or *tympanic membrane*; in the rabbit there are long external ears, which are not represented here nor in birds. The *nostrils* are not in connection

with a prominent nose or beak, but are two small openings near the anterior upper surface of the head. The *mouth* is wide, and there is only one posterior opening, the *cloacal aperture*.

(2) Alimentary Tract.

In the mouth there are *teeth* in the upper jaw and in the roof of the mouth on bones known as the vomers. There are no teeth in the lower jaw. The inner openings of the nostrils or *internal nostrils* are situated slightly in front of the vomerine teeth and communicate with the exterior. Another two apertures are the *eustachian tubes* or recesses situated further back at the sides of the back of the mouth in the part of the alimentary tract known as the pharynx. These lead into the ear cavity or *tympanic cavity*, and a bristle can be passed through the drum of the ear into the mouth by the opening. The *tongue* is large and attached by its anterior end to the floor of the mouth; its free end is bi-lobed and turned backwards, and it can be suddenly shot out in catching insects, etc. Behind the tongue is an aperture on the floor back of the mouth which leads into the lungs, and is called the *glottis*. All these parts can be made out with-

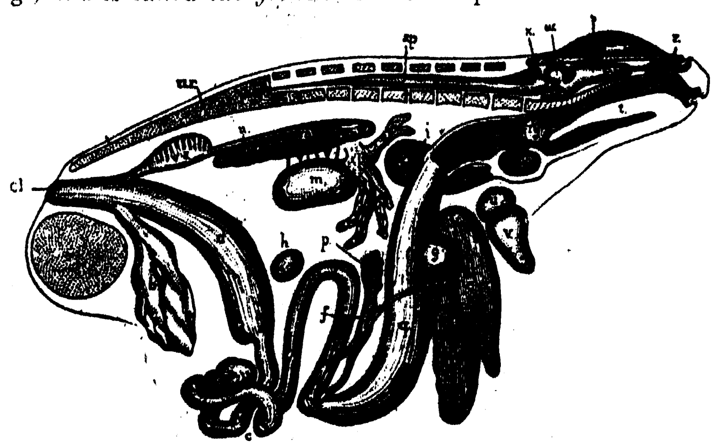


Fig. 1.—General view of the viscera of the male frog, from the right side (Marshall). *a*, stomach; *b*, bladder; *c*, small intestine; *cl*, cloacal aperture; *d*, large intestine; *e*, liver; *f*, bile duct; *g*, gall bladder; *h*, spleen; *i*, lung; *k*, larynx; *l*, fat body; *m*, testis; *n*, ureter; *o*, kidney; *p*, pancreas; *r*, pelvic symphysis; *s*, cerebral hemisphere; *sp*, spinal cord; *t*, tongue; *u*, auricle; *ur*, urostyle; *v*, ventricle; *v.s*, vesicula seminalis; *w*, optic lobe; *x*, cerebellum; *y*, Eustachian recess; *z*, nasal sac.

out dissection. To see the other parts, the frog must be opened, and this may be done by making a longitudinal cut along the ventral surface. Note that the skin is very loosely attached to the body, and that there are large spaces between it and the muscles of the body. Note also that the cut, if directly in the middle line of the abdomen, may pass through a large vein in the body wall, and that between the fore limbs it passes through a number of hard bones. It is better to first fix the frog on its back by means of pins through the limbs and the dissection is best carried out in a dish of water. It will then be seen that the *pharynx* is followed by a short tube, the *œsophagus*, leading into the *stomach*, a simple tubular sac about an inch and a half in length. Compare this very simple stomach with the complex stomach of the ox, which consists of several chambers, each modified for a special purpose. Lying above the œsophagus there will be seen in the dissection the heart and further back the large brown lobes of the *liver*, which is really a complex outgrowth from the digestive tract. In its substance may also be seen a bladder, the *gall*

bladder, which may be filled with the bile, a fluid secreted by the liver. A duct, the *bile duct*, may be traced from this to the part of the intestine which follows the stomach, viz., the duodenum. This duct in its course passes through a long irregular whitish body, from which it also gets branches. This body is the *pancreas*, which, like the liver, also pours a secretion, the pancreatic juice, into the intestine. The part of the intestine into which the liver and pancreas pour their secretions, is called the *duodenum*; it is the first part of the intestine, and lies alongside the stomach; it is about an inch in length and is marked off at one end from the stomach by a constriction called the *pyloric constriction*; at its other end it passes without any marked change into the *small intestine*, a long, narrow, convoluted tube, which ends in a much wider part the *large intestine* sometimes called the rectum. Into the last part of this there open the ducts from the kidneys and from the genital organs. This part, into

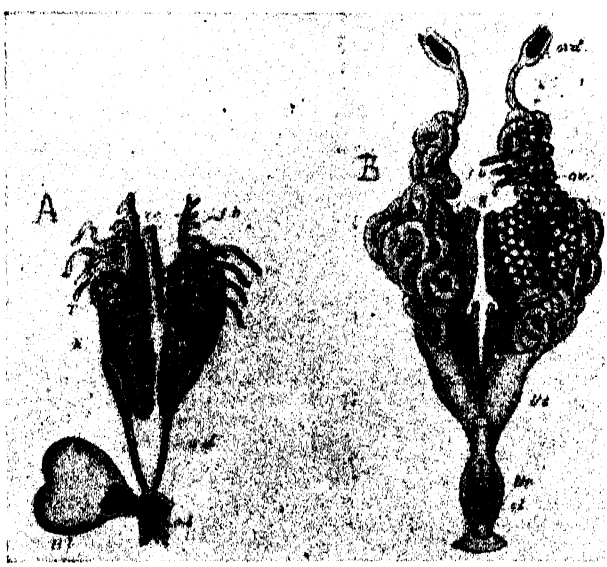


Fig. 2.—Urinogenital system of (*A*) male and (*B*) female frog (Thomson after Ecker). *Bl*, bladder; *cl*, cloaca; *f.b*, fatty bodies; *ov.d*, opening of oviduct; *ov*, ovary; *k*, kidney; *T*, testis; *Ut*, uterus; *Ur*, opening of ureters into cloaca in front of openings of oviduct.

which, therefore, there open the intestine, the ducts of the urino-genital organs, and on its ventral surface a thin walled sac, the *urinary bladder*, is called the *cloaca*. There is a cloaca in birds and reptiles but not in the higher forms, such as the rabbit or ox. The *spleen* is a small round dark-red body lying near the commencement of the large intestine but not connected to it by a duct. All of these organs lie in the body cavity which is lined by a thin membranous fold of the *peritoneum*, or rather the *parietal* layer of the peritoneum, as at the roof of the cavity it hangs down in a double layer or sheet the *mesentery*, and passes round the alimentary canal where it is known as the *visceral layer* of the peritoneum. All the organs above described are thus suspended from the roof of the body cavity.

(3) Excretory System.

The *kidneys* are two oval bodies attached to the upper part of the body and lie one on each side of the backbone. They are covered by the peritoneum. They extract the waste products from the blood and pass

them into the cloaca by two tubes, the *ureters*, which in the male also serve for the passage of the sexual products which may be stored up for a time in a little pouch or dilatation in the tube, the *vesicula seminalis*. In the female they have, however, no connection with the genital organs. Small, yellowish-red patches, the *adrenal bodies*, occur on the ventral surface of the kidney. Near the kidneys may also be seen bright yellow bodies consisting mostly of fat, the *corpora adiposa*, or fat bodies.

(4) Reproductive System.

The male reproductive organs, the *testes*, are oval bodies somewhat resembling the kidneys in shape and lying in front of them. The sperms or *spermatozoa*, given off by these bodies are carried by small tubes through the anterior part of the kidneys and then into the kidney duct, which thus acts both as a ureter and a *vas deferens*, and has the enlarged part or *vesicula seminalis*, for the storing of the sperms.

The female reproductive organs have no connection with the kidneys. The *ovaries*, or mass of developing eggs, may be very large. The eggs are conducted to the exterior by two long twisted tubes, the *oviducts* which are slightly dilated before they open into the cloaca. This dilatation is called the *uterus*, though in higher forms it has quite a different function to perform. The two openings into the cloaca are quite distinct from the openings of the ureters.

(5) The Vascular System.

This consists of: (1) *The Heart*, which is merely a muscular sac for driving the blood to all parts of the body; (2) *the Arteries*, or vessels by which the blood is distributed to the body; (3) *the Veins*, which convey the blood back to the heart, and (4) *the Capillaries*, or system of small vessels connecting the veins and arteries together in various parts of the body.

(1) THE HEART of the frog is a simple structure, more complex than in fishes, but not so complex as in higher animals. It lies in a thin walled cavity, the *pericardium*, and has four parts. (*a*) Two thin walled closely applied *auricles*, a right and left, into which the blood from the body is returned. These appear as the dark parts of the heart in a dissection, as they are filled with blood. (*b*) The single muscular *ventricle* forming the paler apex of the heart, which receives the blood from the auricles and pumps it to the body. A series of valves or flaps (auriculo-ventricular valves) prevent the blood from flowing back into the auricle. (*c*) On the contraction of the ventricle, the blood is therefore forced into a cylindrical tube, the *truncus arteriosus*, which is the commencement of the arterial system, and in this tube are little pocket-like valves (semilunar valves), which prevent the blood flowing back into the ventricle. There is also here a spiral valve or flap in the form of a longitudinal ridge. The truncus arteriosus divides up into branches which send blood to the lungs and to the body generally. (*d*) Behind the heart, and not so easily seen is a thin walled sac, the *sinus venosus*, into which the impure blood from the body collects before passing into the right auricle; the purified blood from the lungs passes by an aperture, the opening of the pulmonary vein, into the left auricle.

(2) ARTERIES.—The *truncus arteriosus* divides into two branches, passing to the right and left side of the body. Each of these divides again into three main trunks or arches. (*a*) *The carotid arch*, giving off a lingual artery to the tongue and a carotid (on which is a slight swelling the "carotid gland") to the mouth orbit and brain. (*b*) *The systemic arch*, or

trunk, giving off a laryngeal to the larynx and œsophageal to the œsophagus, an occipito-vertebral to the head and backbone, and a subclavian or brachial to the shoulder and fore limb. Then each systemic trunk unites behind into one (the dorsal aorta), which give off a single coeliaco-mesenteric artery to stomach, intestine, liver and spleen, renal arteries to the kidneys and genital arteries (spermetic or ovarian) to the reproductive organs; finally, the dorsal aorta divides into two iliac arteries, which supply the hind limbs. (c) *The pulmo-cutaneous trunk*, giving off a pulmonary artery which goes to the lung and a cutaneous to the skin.

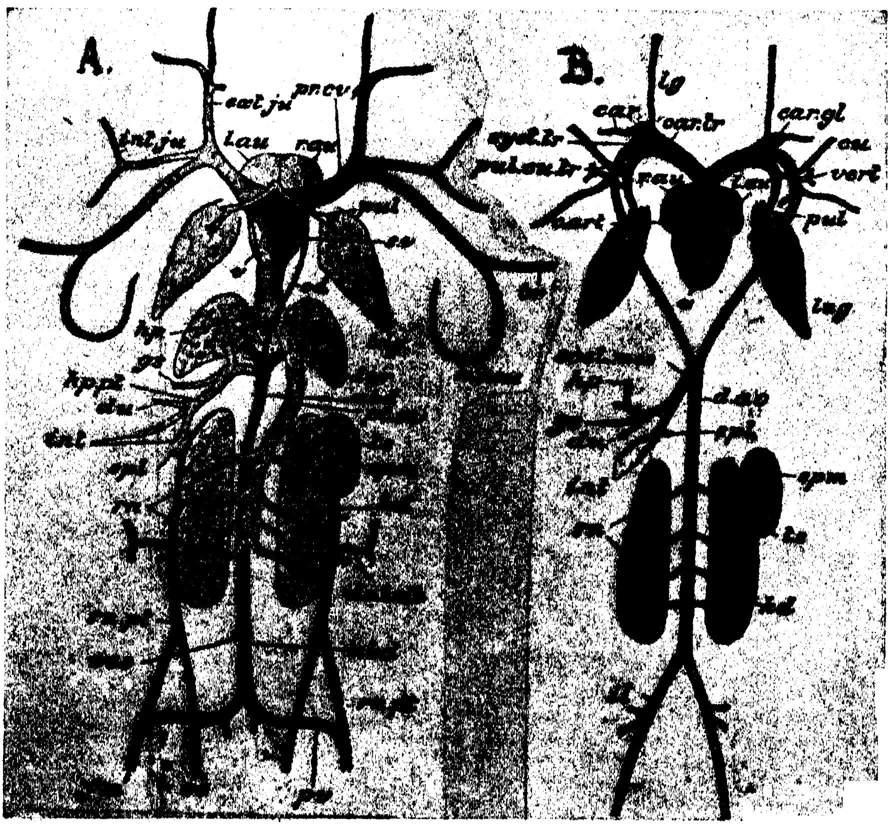


Fig. 8.—The Frog. *A*, venous system; *B*, arterial system (Osborne after Parker).

(3) VEINS.—Blood is returned to the sinus venosus by two large vessels in front, the *pre-cavals*, or anterior venæ cavæ, and one large *post-caval*, or inferior vena cava. Each pre-caval receives blood from vessels, of which the chief are the external jugular from mouth, tongue, and lower jaw, the innominate (including the internal jugular from the interior of the skull and the subscapular from the back of the arm and shoulder) and the subclavian (including the brachial from the arm and the musculo-cutaneous from the skin, superficial parts of the head, and muscles of the abdomen). The post-caval or inferior vena cava, receives blood from the kidneys by renal veins, from the genital organs by genital veins (spermatic or ovarian) and from the liver, which it penetrates, by the hepatic veins. So far the arrangement of the veins does not differ very markedly from that of the arteries, but we have now to note that the blood

from the hinder part of the body and viscera is not returned directly to the heart, but the blood from the hind limb passes forwards by the femoral vein which divides into one branch, the renal portal, which is joined by the sciatic from the back of the leg and goes to the kidneys, into which it divides up into fine vessels; the other branch (the pelvic vein) joining the corresponding vein of the other side of the body to form the anterior abdominal vein, which runs to the liver. Other veins also pass into the kidneys in the same way, viz., the dorso-lumbar from the dorsal well of the body, and veins from the genital organs. The system of veins carrying blood to the kidneys in this way is known as the renal portal system. The veins carrying blood to the liver in a similar way are known as the hepatic portal system; they are the anterior abdominal, first formed by the union of the two pelvics and joined by veins from the bladder from the ventral well of the body and from the heart (cardiac vein). All these vessels carry impure blood to the heart which sends it on to the lungs by the arteries already mentioned. After purification it is returned by two veins (the pulmonary veins) which unite together and pass into the left auricle.

Compare this blood system with that of higher forms. The heart of a pigeon, rabbit or sheep, etc., will be found to have the ventricle divided into two, so that there are four chambers altogether, and in the pigeon (and birds generally) there is only one arch, that on the right, which is continued into the dorsal aorta, while in the rabbit, sheep (and mammals generally) there is only a left aortic arch. In the pigeon the renal portal system has almost disappeared, and there is no trace of it in mammals.

(6) The Skeletal System.

The Backbone or Vertebral Column consists of nine bony rings or vertebrae and a long bone, the urostyle, which is really several vertebrae fused together. A typical vertebra as, for instance, the third, has the space or neural canal in which the spinal cord lies, the body or centrum of the vertebra from which springs the bony arch to form the neural canal, the small and blunt spinous process at the top of the arch, the transverse process, and the facets (zygapophyses) by which the vertebra is articulated to the others. Note that the first vertebra or atlas has no transverse processes, and has two facets or condyles by which it articulates to the skull.

The Skull has at its posterior end a large opening (the foramen magnum) leading into the cavity in which the brain lies. On each side of this opening two small bones (ex-occipitals) with facets or condyles may be seen. Compare birds in which there is only one condyle and mammals, which again have two. Looking at the skull from above the following bones will be seen: Two parieto-frontals, sphenethmoid, two nasals, squamosals, permaxillary, maxilliary and quadrato jugal. The quadrate (a prominent bone in the skull of the bird but absent in the mammal) is reduced to a cartilaginous bar between the squamosal and pterygoids, and is not seen in the dried skull Turning the skull over, and viewing it from below, a large dagger-shaped parasphenoid (reduced in birds, absent in mammals) may be seen forming the floor of the skull. At each side of it are two hammer-shaped bones (the pterygoids), and in front two teeth-bearing bones or vomers (a single bone in birds and mammals). The palatines are small bars of bones behind the vomers.

The Limbs and Limb-Girdles.—The forelimb is on the same plan (serially homologous with) the hind limb. Thus, corresponding with the upper arm or humerus in the fore limb, we have the thigh-bone or femur of the hind limb. In the same way the fore arm or radio-ulna (two separate bones in the young frog) correspond to the leg or tibio-fibula (also two bones fused into one). Corresponding with the wrist bones or

carpals (six in two rows) we have the ankle bones or tarsals (two in two rows—the first row of two long bones, the astragalus or tibiale, and calcaneum or fibulare, and the second of two very small bones). Following the wrist are five metacarpal bones with four fingers, the two innermost of which have two joints (phalanges), and the other two three joints; the thumb is absent; in the hind limb these elements correspond to five metatarsals followed by five toes, the first, second and fifth each with two joints, the third with three, and the fourth with four. The limb girdles of the fore and hind limbs also have corresponding parts, though superficially looking very different from each other. The girdle for attachment

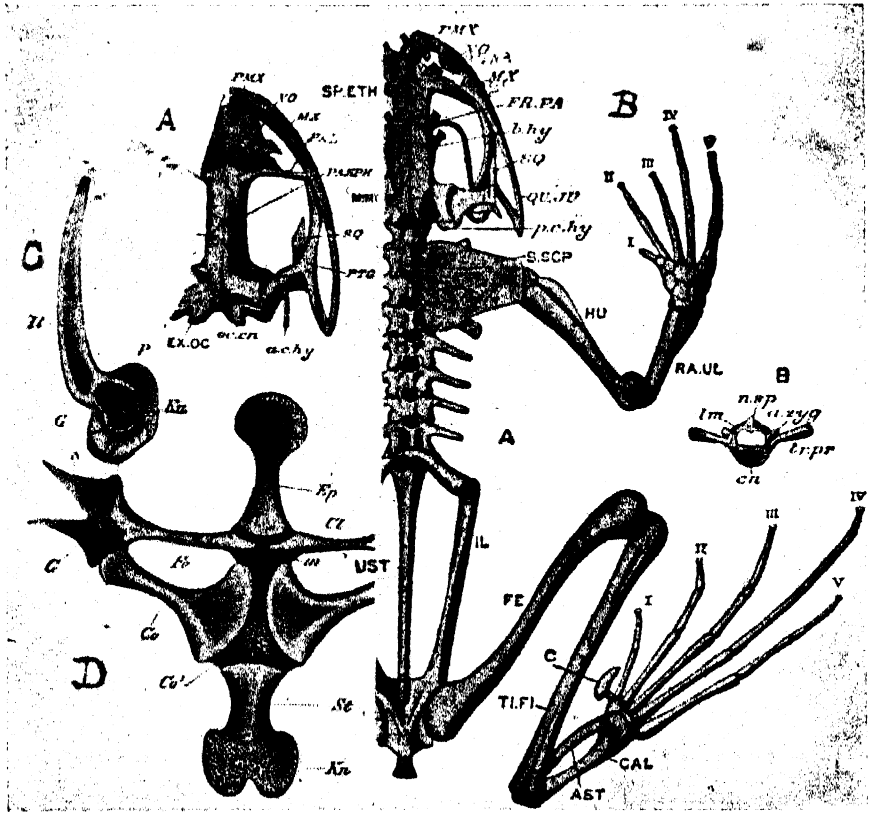


Fig. 4.—Skeleton of frog. *A*, under side of skull; *B*, right half of skeleton (Osborne after Howes); *C*, pelvic girdle (Wiedersheim); *D*, pectoral girdle (Marshall).

of the fore limb (pectoral girdle) has an upper part, shoulder blade, or scapula (with a partly cartilaginous supra-scapula) and a ventral part consisting of two bones connected to the breast bone or sternum, viz., the clavicle or collar bone, and behind it a stouter bone, the coracoid, with which is to be associated the precoracoid, a bar of cartilage and the cartilaginous epicoracoid at its base. Scapula, clavicle and coracoid meet at a point where there is a cavity (the glenoid cavity) for the reception of the head of the humerus. The ilium, pubis and ischium form the girdle (pelvic) by which the hind limb is attached to the body. The first is long and forked, and is attached to the transverse processes of the ninth vertebra, the others are reduced, and they all meet, forming a single mass

with a cavity (the acetabulum), in each side, for the reception of the heads of the femurs. The sternum, or breast bone, consists of various elements: the omosternum, episternum, sternum and xiphisternum.

We shall see that these various elements have corresponding parts in the other groups of animals, but often differ much in appearance. Thus, for instance, they are to be traced, but become very much modified, in the wing of a bird, or the limb of a horse; some of them may disappear altogether.

The Nervous System and Sensory Organs.

THE BRAIN, viewed from above, shows the following parts: Olfactory lobes, cerebral hemispheres, the thalamencephalon with the pineal body, the optic lobes, the cerebellum, and finally the medulla oblongata, which passes into the spinal cord.

There are ten pairs of NERVES passing off from the brain: olfactory, optic, oculimotor, pathetic, trigeminal, abducens, facial, auditory, glosso-pharyngeal and vagus. There are also ten pairs of nerves passing off from the spinal column, and these may readily be seen in a dissection; connected with them is a chain of ganglia forming the sympathetic system.

SENSORY ORGANS.—There is a diffuse sense of touch on spots scattered irregularly over the skin, a more localised sense of taste in taste papillae in the mouth. The sense of smell is associated with certain cells which occur in the nasal passages, and are slender, and are provided with fine processes. The sense of sight has more specialised organs. The eye is like a camera, having a dark chamber, the eyeball, or sclerotic, completely closed except for the point of entrance of the nerve behind, and having a transparent anterior part (the cornea); there is also a lens, which can throw a picture of the outside world on a sensitive sheet of tissue, the retina, and this, like some photographic plates, is "backed" by a dark covering, the choroid. The ear in the frog is a comparatively simple organ. The drum, or tympanic membrane, which we have already noticed, is connected to the inner ear, or organ of hearing proper by a thin rod, the columella, which in the higher forms is composed of three bones (incus, malleus and stapes). The inner ear consists of canals with auditory cells.

II. Minute Structure of Animals.

The various parts of an animal are made up of minute cells combined into tissues. The simplest combination of cells is found in the blood, which consists of a colourless fluid, or plasma, in which float blood cells or corpuscles of two kinds, red and white. In the frog, as in fishes and

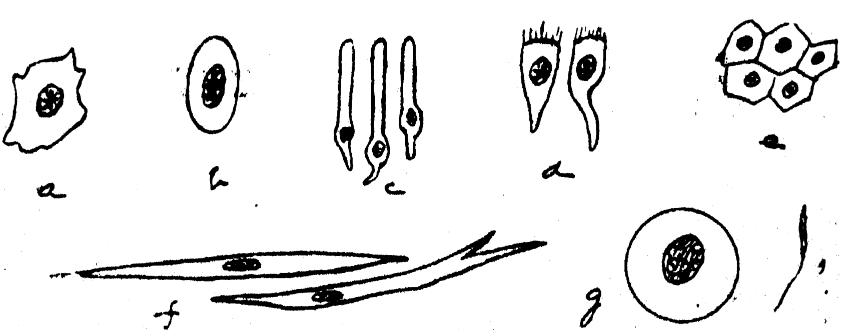


Fig. 5.—Various kinds of cells. *a*, white blood corpuscle; *b*, red blood corpuscle; *c*, columnar; *d*, ciliated; *e*, squamons; *f*, muscle cells; *g*, ovum; *h*, spermatozoum

reptiles, they are flat, oval in outline, and contain a nucleus; in mammals they are flat, round (except in camels, where they are oval), and do not contain a nucleus. The white blood corpuscles are not numerous; they are spherical, with an irregular outline, and show amoeboid movements. The other cells of the body are mostly united firmly together, and form definite tissues. The simplest kind is that which lines the external surface and cavities of the body, and is known as *epithelium*. It may consist of a single layer of cells, or of stratified layers, and the constituent cells may be scale-like (squamous), columnar or ciliated. *Muscle* consists of very elongated cells, which may be simple, non-striped, or involuntary; or more complex, striped or voluntary muscle. *Nervous tissue* consists of more branched cells, and such cells may be aggregated into masses called ganglia. *Bone* and *cartilage* consist essentially of cells embedded in a bony and cartilaginous matrix respectively. A miscellaneous variety of cells are included in *connective tissue*, such as white fibrous tissue, yellow elastic tissues, or a mixture of these—areolar tissue. These consist of homogeneous fibres with connective tissue cells. A form of connective tissue is fat or *adipose tissue*, consisting of a network of connective tissue in which are imbedded cells in which fat or oily matter has accumulated. *Glands* may be considered a kind of epithelium, in which the cells secrete various substances. They may be simple glands in the form of cells on the surface of the body, or in tubular depressions. More complex *gastric glands* occur in the stomach and intestines secreting the digestive fluids. Still more complex or *compound glands* are represented by the liver, whose cells secrete bile, and the kidneys, whose cells extract the waste products from the blood.

III. Functions of the Animal Body.

The chief activities of protoplasm are connected with the absorption of food and excreting of waste products. *Digestion*, or the changing of food into a form which can penetrate to the various tissues of the body, is an important function. The process is begun by the salivary juice secreted by various glands of the mouth. This juice contains ptyalin, which converts starch into sugar. The glands of the stomach secrete pepsin, which changes the proteids into peptones. The pancreas secretes a fluid which carries on both these processes a stage further, besides changing fat into an absorbable form. The bile secreted by the liver also assists the process of digestion, but this organ has other functions to perform, and its secretions would appear to be rather of the nature of a waste product. There are also glands on the walls of the intestines which assist in digestion. The parts of the food thus rendered soluble are *absorbed*, being carried to all parts of the body, chiefly by the blood, and *assimilated* into the substances of the protoplasmic cells. The remaining non-digested food is passed on by wave-like (peristaltic) contraction of the intestine and escapes from the body as a solid mass (foeces). The waste products which result from the processes taking place in the living cell (metabolism), which is contsantly building up (anabolism), and breaking down (katabolism), have to be got rid of, and this work is performed chiefly by the kidneys, which consist of a mass of fine tubes surrounded by fine blood vessels. The cells constituting the tubes extract these waste products from the blood, which are passed to the exterior by the ureter as urine. Besides ordinary food, the body also requires oxygen, which may, therefore, be regarded as another kind of food. This is more easily procured, viz., in *respiration* or breathing; the red blood corpuscles have a substance, haemoglobin, which has a great affinity for oxygen, and, as the blood passes through the fine capillaries of the lungs, which are filled with air, the oxygen is absorbed and carried to all parts of the body. At the same time another waste product, the result of the combination

of oxygen with carbon, is got rid of, viz., carbonic acid gas, which passes out from the blood into the air passages of the lungs, and thence to the exterior. An important function is performed by the *reproductive organs* —the ovaries of the female and the testes of the male. These organs set free the reproductive cells, ova and spermatozoa, the result of the combination of two of which is a new individual which gradually grows into the adult form. All the other cells of the body, for some reason as yet unknown, break down after a longer or shorter time, and the organism is said to die.

IV. Embryology.

The ovum, or egg, which is given off from the ovary is a nucleated mass of protoplasm like other cells. It may be large, being heavily charged with food material, as in the egg of a frog or fowl, for the use of the developing embryo; or it may be small, as in mammals, the embryo obtaining its nourishment in other ways. The egg first undergoes a process known as *maturation*, in which it gives off part of its nucleus and protoplasm in the form of little cells or polar bodies. The spermatozoa, which are given off from the testes, are small active cells with vibratile tails. One of these enters the ovum, thus bringing about *fertilisation*, which consists of the fusion of their two nuclei, so that the fertilised egg (oosperm) is now a typical cell with one nucleus. It begins to divide rapidly (*segmentation*), so that a mass of cells is formed which gradually grows to the adult form. There may be enough yolk to enable it to grow to a stage at which it can feed itself, as in the frog or fowl, or it may have an outgrowth from its body by which it is attached for a time to the wall of the uterus of the mother, thus obtaining its nourishment. This outgrowth the *allantois* (from the primitive digestive tract of the embryo) also occurs in the frog, where, however, it forms the urinary bladder; it occurs also in the embroyonic fowl in the egg, to the shell of which it becomes attached, and acts as a respiratory organ. In the mammal it fuses to the wall of the uterus to form the *placenta*. In the embryonic fowl and mammal a fold (the *amnion*) grows over the developing animal, which forms a sort of sac in which it lies safely.

Subdivision of the Animal Kingdom.

The animal kingdom may be divided into the following groups:—

I. Protozoa, or minute simple animals.
II. Coelenterata, or sea anemones, jelly fish, etc.
III. Porifera, or sponges.
IV. Platyhelminthes, or flat worms.
V. Nemathelminthes, or round worms.
VI. Annelida, or segmented worms.
VII Arthropoda, or animals with jointed limbs, such as crabs, spiders, insects, etc.
VIII. Mollusca, or snails, mussels, etc.
IX. Echinoderma, or starfish, sea urchins, etc
X. Pisces, or fishes.
XI. Amphibia, or frogs, toads, newts, etc.
XII. Aves, or birds.
XIII. Reptilia, or reptiles, such as tortoises, snakes, lizards, etc.
XIV. Mammalia, or mammals, such as rabbits, sheep, horses, man, etc,

These may be arranged into larger groups. Thus, the Protoza may be designated single-celled animals, in contrast to all the other groups which are Metazoa, or many-celled animals. Groups I.-IX. have no back bone, and are called Invertebrata, while X.-XIV. have a backbone and are called Vertebrata. The groups I.-V. have no true body cavity, which is present in VI.-XIV., which are, therefore called Coelomata. Group II. includes radially symmetrical animals, while all above it are bilaterally symmetrical. Fishes and amphibians present certain affinities, which justify their being placed together in one group, the Ichthyopsida, in contrast to the Reptiles and Birds, which constitute the Sauropsida. Again, Reptiles, Birds, and Mammals resemble each other in having certain embryonic structures, an amnion and allantois, and may accordingly be termed the Amniota.

The main tribes or stocks of the animal kingdom are usually termed Phyla. They may be divided into classes, and in their turn classes may be subdivided into orders, orders into families, families into genera, genera into species, and finally species into varieties. Species may be regarded as the lowest true subdivision, as different species as a rule remain distinct, and do not cross with each other. Where they do the progeny is known as a hybrid, and is usually incapable of producing offspring. An animal is usually known by its generic and specific name. Thus, the horse is called Equus caballus, as it belongs to the species caballus and the genus Equus. The donkey is Equus asinus. The mule is a hybrid between these species. The genus Equus belongs to the family of the Equidae.

(To be continued).

ANIMAL DISEASES—CONTAGIOUS AND INFECTIOUS.

Summary of Outbreaks of Contagious and Infectious Animal Diseases Scheduled under Act No. 27 of 1893.

Still under Quarantine on 31st May, 1909.

District.	Anthrax.	Epizootic Lymphangitis.	Glanders.	Lungsickness.	Redwater.	Scabies (Equines.)	Sponssiekte.	Tuberculosis.	Totals.
Albert									1
Aliwal North									1
Barkly East				2					3
Barkly West	1								1
Cape									4
East London	1								14
Fort Beaufort	...	...	...	...	1				1
Glen Grey	...	...	...	...	2				2
Herschel	...	...	...	...	2				5
Humansdorp	...	3	...	...	...				3
King William's Town	3	...	...	10	...				19
Komgha	...	...	...	6	...				10
Kuruman	1	...	...	...	...				1
Peddie	...	...	2	1	...				3
Port Elizabeth	...	...	...	...	...				1
Prieska	...	...	...	1	...				1
Stockenstrom	...	...	...	...	...				1
Stutterheim	...	...	...	3	...				3
Wodehouse	...	...	...	1	1				2
Tembuland.									
Umtata	...	...	...	8	...	...	...	...	8
Engcobo	...	...	...	19	...	...	...	...	19
St. Mark's	1	...	...	5	9	...	3	...	18
Mqanduli	...	...	...	10	...	...	6	...	16
Elliotdale	...	...	...	4	...	...	5	...	9
Transkei.									
Butterworth	...	...	...	6	...	1	4	...	11
Kentani	1	...	...	10	...	...	6	...	17
Nqamakwe	...	...	...	10	1	...	2	...	13
Tsomo	...	...	...	2	...	...	...	...	2
Idutywa	...	...	...	3	...	...	...	...	3
Willowvale	...	...	...	23	...	...	12	...	35
ohn's	...	...	...	1	...	...	...	...	1
Pondoland.									
Libode	...	...	...	5	...	...	...	...	5
Ngqeleni	...	...	...	9	...	...	1	...	10
Lusikisiki	...	...	...	3	...	...	...	...	3
Bizana	...	...	...	2	...	...	...	...	2
Flagstaff	...	...	...	2	...	...	...	...	2
Tabankulu	...	...	...	13	...	...	...	...	13
East Griqualand.									
Mount Ayliff	...	...	...	1	...	...	...	...	1
Umzimkulu	...	...	...	...	...	...	5	...	5
Qumbu	...	...	...	3	...	...	1	...	4
Tsolo	...	...	...	25	...	...	2	...	27
Mount Frere	...	...	...	3	...	...	...	...	3
Maclear	...	...	...	2	.	...	...	...	2
Totals	8	3	2	198	17	4	69	4	305

GEORGE ROWE, for Chief Veterinary Surgeon.

Office of the Chief Veterinary Surgeon,
Cape Town, 2nd July, 1909.

RELATIVE RUST-RESISTANCE AND YIELD OF VARIOUS VARIETIES OF WHEAT, OATS, AND BARLEY.

ROBERTSON EXPERIMENT STATION, No. 2.

By R. W. THORNTON, Government Agriculturist.

At the present time Cape Colony only produces a comparatively small proportion of the wheat required for home consumption. Hence it is obvious that there must be a ready market for wheat for many years to come before the supply is equal to the demand. The producer is assisted against other countries, as there is a protective duty of 1s. 2d. per 100 lbs. on wheat grain, and 2s. 6d. per 100 lbs. on flour. The necessity for producing more wheat is being felt more severely as time goes on, and the price of wheat and bread at the present day should prove an incentive to increased production, in fact the world's supply and demand for wheat is so nearly balanced that a very bad season in any of the great grain-producing countries is likely to make bread the rich man's food instead of that of the poor man.

In our grain-producing districts of the West and the Eastern Province there are several great difficulties to overcome. In the West the production per acre is now far lower than it was fifty years ago. The reason for this is undoubtedly that our land is becoming more and more impoverished and washed out, and unless steps are taken to restore humus to the soil, and to manure so as not to further impoverish the soil, that is by using complete artificial fertilisers, we are likely to reduce our yields more and more, especially as the holdings become smaller, and land cannot on that account be allowed to lie fallow for four and five years at a time. If a leguminous crop of some sort were grown on this fallow land, the soil would be greatly improved. Steps are being taken in this direction this season in the shape of rotation experiments.

The greatest drawback of all to the grain farmer has been rust. This fungus causes great loss practically every year, and with a view to obtaining rust-resistant varieties this experiment has been carried out, as it is felt by all farmers that the only way to combat the rust trouble is by having a cereal that will withstand this disease, and such cereals can only be obtained by trying imported varieties that have proved resistant in other countries and by means of hybridising. With reference to the latter, experiments have been carried out at the Robertson Experiment Station for the past three years, and it is hoped that at the end of the coming season some new varieties of wheat will have been established. This hybridising of wheats is a lengthy and tedious process, but several of the wheats at Robertson give great promise this season.

In 1907-8 a great number of local and imported varieties of wheat, oats, and barley were tested, and a short summary of the results obtained is here inserted in tabular form.

SEASON 1907–08. EXPERIMENT No. III. CEREAL VARIETIES. SEED SOWN ON THE 10TH JULY, 1907.

WHEAT

Plot No.		Name of Wheat (Colonial and others.)	Interim Report on the 8th October, 1907.				Notes at Harvest and at Thrashing.		Date of Harvest.	Yield in lbs. per acre.		
			Growth.									
Actual.	Current.		Height.		Rust on Straw.	Ladybirds.	Rust in Grain.	Ear.		In Field.	Grain.	Straw and Chaff.
1	2	3	4	5	6	7	8	9	10	11	12	13
1	322	Darling ...	3' 4"	Piping pale green, good crop, promising.	Considerable	Free ...	Slight ...	Eaten out a lot by birds.	5th December	2,840	320	2,520
2	323	Gluyas Early...	3'	Coming into ear, fine crop.	Considerable	Free ...	Free ...	Eaten out a lot by birds.	25th November	3,180	530	2,650
3	324	Budds Early ...	24"	Coming into ear, fine crop.	Free ...	Considerable	Slight ...	Very much eaten by birds.	5th December	1,600	300	1,300
4	325	Jonathan ...	24"	Coming into ear, fine crop.	Slight ...	Few ...	Slight ...	Birds	5th December	1,880	305	1,575
5	326	White Early ...	24"	Piping, promising fair	Considerable	Bad ...	Very bad	... ...	15th December	Total failure due to rust.		
6	327	Van Niekerks	30"	Piping, promising good crop.	Slight ...	Few ...	Very bad	Small heads ...	25th November	Total failure due to rust.		
7	328	Du Toits ...	3'	Coming into ear, promising fair crop.	Bad ...	Few ...	Very bad	Practical failure.	25th November	1,700	120	1,580
8	329	Durum ...	2½'	Promising good crop ...	Slight ...	Few ...	Very bad	Practical failure.	5th December	1,200	110	1,090
9	330	Wonderkroon	2½'	Promising very good crop.	Very slight	Considerable	Bad ...	Practical failure.	23rd December	2,600	80	2,520
10	331	French ...	2'	Promising fair crop ...	Slight ...	Few ...	Slight ...	Fair yield, bird eaten.	23rd December	1,600	210	1,390
11	332	Du Plessis ...	18"	Promising fair crop ...	Slight ...	Considerable	Very bad	Practical failure.	5th December	1,100	65	1,035
12	333	Kaalkop ...	2'	Promising good crop ...	Slight ...	Very few	Very bad	Practical failure.	23rd December	2,000	180	1,820
13	334	Spring... ...	2½'	Promising good crop ...	Very slight	Very few	Bad ...	Practical failure.	15th December	1,800	110	1,690
14	335	Baard	3½'	In ear, promising very good crop.	Slight ...	Free ...	Slight ...	Fair	25th November	2,200	280	1,920
15	337	Wit Koorn ...	3½'	In ear, promising very good crop.	Slight ...	Free ...	Bad ...	Poor	25th November	1,600	110	...

16	338	Spring Pearl ...	18"	Backward, lots of weeds	Considerable	Free ...	Bad ...	Practical failure.	23rd December		45	
17	339	Kolleen ...	18"	Backward, lots of weeds	Considerable	Free ...	Bad ...	Practical failure.	23rd December	,210	40	70
18	340	Extra Square Head. ...		Only few plants, bed overgrown with weeds.	Considerable	Bad ...	Total	failure, no crop	at all.			
19	341	Round Square Head. ...		Only few plants, bed overgrown with weeds.	Free ...	Bad ...	Total	failure, no crop	at all.			
20	342	Bore	24"	Few plants, piping ...	Considerable	Bad ...	Total	failure, no crop	at all.			
21	343	Bertus... ...	2	Promising fair crop ...	Slight trace	Few ...	Bad ...	Practical failure.	23rd December	1,400	40	,370
22	344	Walla Walla ...	18"	Promising good crop ...	Slight trace	Considerable	Considerable	Practical failure.	23rd December	1,600	110	,490
23	345	Grand Poulard	12"	Backward, poor crop ...	Free ...	Few ...	Very bad	Total	failure	1,000	Nil	,000
24	346	Golden Ball (Departmental).	24"	Promising fair crop ...	Slight ...	Bad ...	Destroyed	Total failure ...	23rd December	400	45	355
25	347	Golden Ball (O.R. Colony).	30"	Promising fair crop ...	Considerable	Few ...	Destroyed	Total failure ...	23rd December	1,100	60	
26	348	Dawson Golden Ball.	24"	Promising poor crop ...	Slight ...	Bad ...	Destroyed	Total failure ...	23rd December	960	Nil	
27	349	Elephant ...	24"	Promising poor crop ...	Slight ...	Bad ...	Destroyed	Practical failure.	23rd December	300	40	
28	350	Dumbletons ...	18"	Promising fair crop ...	Slight touch	Very bad	Bad ...	Failure ...	23rd December	800	145	[illegible]
29	351	Kaffir Victoria	18"	Promising fair crop ...	Slight touch	Bad ...	Very bad	Total failure ...	23rd December	1,100	Nil	,100
30	352	Long Pit Victoria.	18"	Promising good crop ...	Slight ...	Bad ...	Bad ...	Failure ...	23rd December	800	120	680
31	353	Bengal ...	24"	Promising good crop ...	Slight ...	Few ...	Considerable	Fair	23rd December	1,140	23)	910
32	354	Roermaker ...	24"	Promising good crop ...	Slight ...	Few ...	Very bad	Total failure ...	23rd December	1,600	25	,575
33	355	White Lamas...	18"	Promising fair crop ...	Slight ...	Considerable	Bad ...	Failure ...	23rd December	800	60	740
34	356	Medeah ...	24"	Promising fair crop ...	Very slight	Considerable	Bad ...	Failure ...	23rd December	800	85	715
35	357	Italian ...	18"	Promising fair crop ...	Free ...	Bad ...	Bad ...	Failure ...	23rd December	825	45	780
36	358	Rooi Koorn ...	16"	Backward, poor ...	Bad ...	Few ...	Considerable	Fair	23rd December	1,500	320	,180
37	359	Red Egyptian	18"	Backward, promising poor crop.	Bad ...	Few ...	Considerable	Fair	23rd December	1,500	310	,190
38	360	Blue	18"	Backward, promising poor crop.	Slight ...	Few ...	Considerable	Poor	23rd December	1,200	160	
39	361	Red Baard ...	24"	Piping, promising fair	Slight ...	Free ...	Bad ...	Practical failure.	5th December			
40	362	Een Been ...	30"	In ear, promising good	Slight ...	Few ...	Considerable	Practical failure.	December	Quantities too to adn	of (lating	lcu- per
41	363	Australian ...	24"	Piping, promising fair	Considerable	Few ...	Considerable	Practical failure.	ber	acre.		

SEASON 1907-08. EXPERIMENT No. III. CEREAL VARIETIES. SEED SOWN ON THE 10TH JULY, 1907.—*Continued.*

WHEAT—*continued.*

Plot No. Actual.	Plot No. Current.	Name of Wheat (Colonial and others.)	Interim Report on the 8th October, 1907. Growth. Height.	Growth.	Rust on Straw.	Ladybirds.	Notes at Harvest and at Thrashing. Rust in Grain.	Ear.	Date of Harvest.	Yield in lbs. per acre. In Field.	Grain.	Straw and Chaff.
42	364	Square Ear ...	14"	Backward, promising fair.	Slight ...	Few ..	Considerable	Practical failure.	5th December			
43	365	Wit Erf ...	14"	Backward, promising fair.	Slight ...	Few ...	Bad ...	Practical failure.	5th December			
44	366	Fru Baard ...	14"	Backward, promising fair.	Slight ...	Bad ...	Bad ...	Practical failure.	25th November			
45	367	Caledon Baard	28"	In ear, promising fair ...	Slight ...	Bad ...	Bad ...	Practical failure.	25th November			
46	368	Klein Koorn ...	...	In ear, promising fair ...	Slight ...	Few ...	Considerable	Fair yield, good grain.	23rd November			
47	369	Wol Koorn ...	...	In ear, promising fair ...	Slight ...	Bad ...	Considerable	Poor	23rd November			
48	370	Rietti ...	...	Fair, somewhat backward.	Very slight	Bad ...	Traces, not damaged.	Comparatively poor.	23rd November			
49	372	New Era ...	...	Sown 31st July, quick growing.	Slight ...	Nil ...	Slight ...	Fair yield ...	28th December			
50	373	Silver King ...	...	Sown 31st July, quick growing.	Slight ...	Nil ...	Slight ...	Good yield ...	28th December	Quantities too small to admit of calculating returns per acre.		
51	374	Comeback ...	...	Sown 31st July, very quick growing.	Free ...	Nil ...	Free ...	Excellent ...	13th December			
52	375	Yandilla King	...	Sown 31st July, very quick grower.	Free ...	Nil ...	Free ...	Excellent ...	15th December			
53	376	Federation ...	...	Sown 31st July, quick grower.	Slight ...	Nil ...	Slight ...	Good yield ...	24th December			
54	377	Marshall's No. 3	...	Sown 31st July, quick grower.	Considerable	Nil ...	Slight ...	Poor yield ...	28th December			
55	378	Darts Imperial	...	Sown 31st July, quick grower.	Bad ...	Nil ...	Very bad	Fair yield ...	28th December			
56	379	Grenadier ...	24"	Few plants, piping ...	Slight trace	Few ...	Total	failure, no crop	at all.			
57	380	Transvaal ...	...	On lime-stone bed, promising poor.	Considerable	Few ...	Bad ...	Poor yield ...	23rd December			
58	381	Bushman ...	...	On lime-stone bed, promising poor.	Considerable	Few ...	Bad ...	Poor yield ...	23rd December			

OATS.

No.	Variety.	Source.	Crop in pounds of Oathay per acre.	Notes.
1	White Tartarian	Scotland ...	2,840	Much attacked by rust, light heads and poor quality of coarse straw, though most in quantity of any.
2	Black Tartar ...	Scotland ...	2,800	Badly attacked by rust, much coarse, tall straw of poor quality for hay.
3	Sparrow Bill ...	New Zealand	2,000	Much rust, very tall coarse straw.
4	White Probsteier	Sweden (from Germany)	2,000	Slightly rusted, fair quality of forage.
5	Appler	Natal ...	2,000	Very slight signs of rust, very good quality. Equal and very similar to No. 6.
6	Texas	Texas, U.S.A.	1,940	In every respect similar to No. 5. These two sorts produced the finest hay of all those tried.
7	Garton	England ...	1,880	Poor quality of oathay, slightly rusty.
8	Probsteier ...	Sweden (from Germany)	1,800	Slight rust, fairly good quality.
9	Black Bell ...	Sweden ...	1,800	Slight rust, fairly good quality.
10	Prolific Black Tartarian	England ...	1,800	Short coarse straw, badly taken by rust.
11	Hvitling... ...	Sweden ...	1,800	Much rust, very inferior.
12	Black Grand Mogul ...	Sweden ...	1,600	Much rust, very poor quality.
13	White Tartar ...	England ...	1,580	Much rust, poor crop.
14	Ligowe	Sweden ...	1,500	Considerable rust, inferior.
15	New Hardy Winter Black	England ...	1,400	Slight rust; short, good heads.
16	Golden Rain ...	Sweden ...	1,400	Considerable rust, inferior quality.
17	Danish	New Zealand	1,000	Badly injured by rust, coarse straw.
18	Canadian ...	New Zealand	1,000	Much rust, coarse straw, poor heads.
19	Potato	Scotland ...	840	Much rust, coarse straw, poor heads.
20	Dunn	New Zealand	740	Much rust, poor crop, good quality.
21	Algerian... ...	Cape Colony	2,345	Average of seven plots varying from 1.440 lbs. to 3,272 lbs., practically free from rust, but injured like the rest from ladybirds.

Barley.

No.	Variety.	Source.	Crop in pounds per acre. Total.	Crop in pounds per acre. Grain.	Notes.
1	Webb's Kinver Chevalier	England ...	2,640	840	Excellent quality and quantity, comparatively little damaged by ladybirds. This and No. 4 are quite the best two sorts.
2	Princess	Sweden ...	2,600	610	A very good barley, somewhat more severely attacked by ladybirds, recommended in Europe for very rich soil.
3	Webb's Golden Grain	England ...	2,140	600	Much damaged by insects.
4	Chevalier	Sweden ...	2,100	860	The earliest and most desirable of all, little injured by ladybirds. Ten days earlier than No. 1, and gave a higher return of grain of excellent quality. It is regarded as a very early sort in Europe too.
5	New Binder ...	England ...	2,100	720	Much damaged by insects.
6	Scottish Chieftain	Piquetberg, C.C.	2,100	345	From Mr. Dale, Ideal Farm, Piquetberg. Fourth at Knysna in order of merit.
7	Swan Neck ...	Sweden ...	2,060	800	Fifth at Knysna in order of merit.
8	Hunchen	Sweden ...	1,800	760	Third at Knysna in order of merit.
9	Webb's Beardless ...	England ...	1,500	360	Second best at Knysna.
10	Chevalier	England ...	1,300	400	
11	Primus	Sweden ...	1,300	460	
12	Beardless	Cape Colony	920	250	
13	New Burton Malting	England ...	500	165	The best at Knysna.
14	Cape Barley ...	Robertson, C.C.	2,404	545	Average of 8 plots grown under the same conditions.

Of the 58 varieties of wheat sown Gluyas Early, an Australian hybrid imported from New South Wales, gave the best results, and wherever this variety has since been tested it has up-held its character. Strange to say, Comeback and Yandilla Ging, Australian wheats which did comparatively well last year, have succumbed to rust this season.

Of the varieties of barley grown last season, we find that the old Cape Six-rowed barley did not give as big a yield as several of the malting barleys. A contrary result was obtained this season, but there is little doubt that malting barley does exceedingly well on our Karroo soil, and a far better price was obtained for it than the Cape barley which was only fit for feeding to stock.

Of the oat varieties tried in 1907-08 the Algerian, Texas, and Appler came out best, and though several other varieties showed a greater crop per acre, yet these crops were so poor in quality and so much destroyed by rust that they were of little value from a feeding point of view.

During this season of 1908-09, experiments similar to those already mentioned were carried out, and the treatment meted to all was the same. Wheat was sown at the rate of 60 lbs. per acre, barley at the rate of 80 lbs., and oats at 120 lbs. All the seed was dressed with bluestone as a preventive for smut prior to sowing, and was harrowed in with a normal dressing of 200 lbs. of complete fertiliser to the acre. The yields obtained throughout, like those of the previous season, are far below normal, due to the enormous damage done by ladybirds, but as all the plots suffered equally the results obtained are reliable as far as relative yield and rust-resistance are concerned.

All the returns given in the following tables are weight of crop in lbs. per acre, and the varieties have been arranged according to merit.

Name.	Sown.	Harvested.	Weight of Total Crop. lbs.	Weight of Grain. lbs.	Proportion of Grain to Straw. lbs.
1. Gluyas Early ...	15th May...	2/11/08	3,150	905	29 : 71
2. Macaroni	" ...	5/11/08	2,250	645	29 : 71
3. Federation... ...	" ...	7/11/08	2,275	550	24 : 76
4. Yandilla King ...	" ...	7/11/08	2,175	325	15 : 85
5. Imported Rietti ...	" ...	10/11/08	3,050	185	6 : 94
6. Comeback	" ...	7/11/08	1,770	102	6 : 94

Of these varieties Gluyas Early was quite the best. It not only gave the biggest yield, but proved rust-resistant, and the grain was of excellent quality. Gluyas, in this instance, as in many others all over the country, took rust in the straw, but this did not affect the crop in any way. As is well-known to most farmers, there is the rust that affects the crop early in the year and that which attacks it at a later stage. Up to the present, as far as we have been able to ascertain, Gluyas Early has always escaped the late rust.

Macaroni wheat proved rust-resistant and grew well, but, like many macaroni wheats, it does not stool out and so, unless sown thickly, the yield is frequently not as good as is anticipated. Grain from this wheat is exceedingly hard. It is, however, this season being hybridised with some of our best soft varieties, to see if we can get a softer wheat with equal rust-resistant qualities.

Rietti, imported last season direct from the province of Rietti, did exceedingly bad, and in this instance, as in most others, was almost entirely destroyed by rust, whereas the same wheat, imported eleven and thirteen years back, still continues to give good returns. The old Rietti in this case was sown side by side with the new, and was entirely unaffected by rust. This season Rietti is again being imported for further trials, but from the same firm from which the original importation thirteen years ago was made. Federation and Yandilla King promised well, but were badly affected by rust just before ripening, and Comeback, which had given such excellent promise in 1907-08 was entirely destroyed, as was also French and Marshall's Number 3.

Flour wheat, Carmichaels, Dart's Imperial, Plover, Farmers' Friend, Bunyip and John Brown, were also destroyed by rust, along with some 40 French varieties, which were all sown in drills in single rows merely to test their rust-resistance. These single rows were tried before purchasing large quantities of seed for distribution all over the Colony.

Barley.—In the past season of 1908-09 only three varieties of malting barley were grown and compared with the Old Cape Six-rowed. This was done owing to the results obtained in 1907-08. The following table shows the result in pounds per acre.

Name.	Sown.	Harvested.	Weight of Total Crop. lbs.	Weight of Grain. lbs.	Proportion of Grain to Straw. lbs.
Cape Six-rowed ...	15th July	1/12/08	2,740	1,122	41 : 59
Webb's Kinver Chevalier	"	1/12/08	2,750	650	27 : 76
Webb's Beardless ...	"	1/12/08	1,975	365	18½ : 81½
New Burton	"	1/12/08	1,625	320	19¾ : 80¼

It will be seen by this table that, though Webb's Kinver Chevalier gave the greatest actual crop per acre, the production of grain was lower than that obtained from the Six-rowed, which, as before stated, is exactly the opposite of the result obtained in 1907-08. All the yields were again comparatively small, due to destruction by lady-birds, but all plots were equally affected. Webb's Kinver Chevalier gave by far the biggest yield of the three malting barleys, and the grain obtained was of magnificent quality. The heads were large and well-filled, whereas the heads from the two other varieties were considerably shorter. The grain from all three was excellent for malting purposes, in fact it is doubtful whether samples of these barleys could be beaten in the world's market for malting purposes, which is sufficient evidence that this Colony can raise barley of the necessary quality for brewing, and though the yield obtained was smaller that that from the six-rowed, the price was so much better that this was neutralised, and, whereas the demand for common barley is comparatively speaking small, for barley of good quality for malting purposes there is annually a big demand. Extensive experiments are being carried out with these malting barleys again this season in Robertson, as well as other districts.

Oats:—In the oat experiment, two varieties of oats were tried against Algerian, with the following results:—

Name.	Sown.	Harvested.	Weight of Total Crop. lbs.	Weight of Grain. lbs.	Proportion of Grain to Straw. lbs.
Algerian	15/5/08	1/12/08	1,725	430	25 : 75
Texas	15/5/08	1/12/08	1,800	395	21 : 79
Black Bell	15/5/08	1/12/08	1,225	90	7 : 93

From the table it will be seen that the Algerian gave the greatest yield of grain, although Texas gave the heaviest total crop. This is contrary to what was expected from experiments carried out in other parts, and only tends to show that the results obtained in one district are not always applicable to others. The soil, proximity to the sea, altitude, etc., apparently exerting considerable influence. The Black Bell oat was of practically no use. The straw is coarse, and the head small. It is neither suitable for hay nor threshing, though it is possible that in other localities it may do better. Texas oat will probably take a first place amongst the oats of the Colony, as it is a better filled and lighter coloured oat than Algerian, and is likely to prove more suitable for the manufacture of oatmeal, though it is far from ideal for this purpose.

Summary.

Wheat.—The endeavour has been made, and is being made, to secure wheats that are rust-resistant, of good milling quality, and that do not shed easily, and as a result of this season's and last season's experiments, we find that Gluyas Early does not shed, is rust-resistant up to the present, and is undoubtedly a far better milling wheat than Rietti, and is, besides, very much earlier. The old Rietti is still rust-resistant, sheds badly if allowed to become too ripe before reaping, and is not a particularly good milling wheat. Macaroni is exceedingly hard, though, up to the present, rust-resistant.

Barley.—With barley attempts have been made, and are being made, to secure a variety most suitable for malting purposes, and which at the same time will give sufficient heavy yield per acre to make its cultivation

a success from a business point of view. Up to the present Webb's Kinver Chevalier has given the best results, and extended trials are being made with this variety this season.

Oats.—In oats the chief points sought after are an oat that withstands rust, and of which the grain is heavy and full for threshing purposes, and one of a lighter colour than Algerian or Texas for the manufacture of oatmeal. There is little doubt that the oatmeal industry will become a leading one in the country, and rolled oats at present on the market of the "Tiger" brand are undoubtedly excellent. With this point in view, it is hoped that farmers will produce oats for oatmeal to an increasing extent, and that a ready market will thus be obtained for a portion of the oats grown in the Colony, so that we shall not be dependent on export alone for our surplus stock of oats. The white Danish oat is apparently the most favoured for oatmeal in the Colony at present.

MILK RECORD.

ELSENBURG COLLEGE HERD.

Subjoined is the Milk Record to the 30th June, 1909:-

Breed and Cow.	Days in Milk.	Yield in Lbs.		
		During June.	Total to date.	Daily Average.
FRIESLANDS.				
Rose	314	707	9,414	30·0
Daisy	181	1,024	6,621	36·6
Romula...	118	911	4,219	35·8
Cleopatra	58	1,700	3,221	55·6
Victoria	49	1,469	2,353	48·0
Vera	7	209	209	29·8
JERSEYS.				
Gilliflower	306	323	6,312	20·6
Gertie	51	863	1,433	28·0
Grace	7	166	166	23·7
Gwendolen	7	195	195	27·9
AYRSHIRE.				
Cherry	56	822	1,643	29·3
CROSS.				
Bessie	7	317	317	45·3

RELATIVE RUST-RESISTANCE AND YIELD OF VARIOUS VARIETIES OF WHEAT AND OATS.

By R. W. Thornton, Government Agriculturist.

An experiment, similar to that conducted at the Robertson Experiment Station, was carried out by Mr. J. J. Theunissen, of Langeberg, near Durbanville, District Cape. Mr. Theunissen carried out the experiment in a thorough and most comprehensive manner. The value of the result obtained from such an experiment for the country at large can hardly be estimated, and if more farmers would undertake similar experiments, and give as comprehensive a report on the results, the difficulty of establishing standard cereal varieties to suit local conditions would be largely overcome. Mr. Theunissen is conducting a further experiment this season with all the wheat varieties imported by this Department.

The result obtained from this experiment is especially valuable on account of Mr. Theunissen's farm being situated in a bad rust area, and also rust was exceedingly severe in most districts during the past season. Of course it cannot be taken as conclusive that all the wheats that withstood rust will continue to do so, but they are worthy of further and extended trials. Old Rietti, Gluyas Early, and Theunissen's wheat will probably continue to hold the lead for some time to come, and of these three Gluyas has the advantage for three reasons, *i.e.*, it is the earliest, it does not shed, and it is the best from the miller's point of view.

Gluyas Early, as at Robertson, gave very satisfactory results all through, and though the same weight of grain was obtained per acre as from the Rietti, the straw obtained was less by 400 lbs., which reduces the cost of handling, and is less exhausting to the soil.

The Old Rietti stood rust well, but the crop from the seed imported last season was badly affected.

Federation is a white wheat which stood the rust well, and is worthy of a further trial, though it was destroyed at Robertson, which shows the necessity of experiments being conducted in various localities and at different altitudes before definite conclusions can be arrived at.

Bobs, strange to say, stood rust well, giving a good return, though this result has not been borne out in the other experiments.

Of the 23 varieties tried, only nine stood the rust test, of which four were white wheats and five dark. These are this season receiving further trials in other districts, as in previous seasons it has been found that a wheat which proves rust-resistant one season may go down to rust the next. Very good examples of this are Comeback and Yandilla King which, in 1907, gave promising results, and this year proved total failures, whereas Federation, though slightly affected the previous year, did as well as Rietti this year.

In comparing these results with those obtained in previous years, the Gluyas Early and Rietti are the only two which remain the same, *i.e.*, rust-resistant, whereas Bobs and Federation have done better this year than they did before. Some of the old wheats, well-known in the Colony, such as Siebritz and Spring, stood well, whereas many of the others gave very poor results.

CEREAL VARIETY EXPERIMENT.—WHEAT.

Variety of Wheat	Is it rust resistant. Yes or No?	Does it take rust in the straw?	Is it early or late, and how much earlier than other varieties?	Is the straw strong or weak?	Does it grow strongly or is it weak?	Does it stool well and ripen evenly?	Long or short ear.	Average length of ear? ins.	Total number of grains in ear?	Beard or beardless?	Does it shed easily?	Colour of grain?	Hard or soft?	Long or roundish grain?	Does the wheat make good bread?	Yield per acre of grain? lbs.	Yield per acre of straw? lbs.	Proportion of grain to straw?	Weight per bushel in lbs.?	Milling quality?	Remarks.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Old Rietti (13 years).	Yes	Slightly	Late	Strong	Slow	Yes	Long	5	40	Beard	Yes	Dark ..	Hard	Roundish	Yes, but dark.	1200	3000	1:2·5	63	Indiffer'nt	Last wheat to ripen.
Gluyas Early	Yes	Slightly	Early	Weak	Strong	Yes	Short	3½	42	Beardless	No	White	Hard	Long ..	Excellent	1200	2600	1:2·16	65·5	Good ..	Three weeks earlier than Rietti.
Theunissens ..	Yes	No ..	Late	Strong	Slow	Yes	Long	5¾	40	Beard	Yes	Brown to Golden.	Hard	Roundish	Yes, a trifle dark.	1200	2800	1:2·3	62	Indiffer'nt	A variety of Rietti.
Spring No. 1 ..	Yes	No ..	Late	Strong	Strong	Yes	Short	4	47	Beard	Yes	Brown	Hard	Long ..	Yes ..	1000	3000	1:3	64·5	Indiffer'nt	Ripens few days before Rietti.
Siebritz ..	Yes	Slightly	Late	Strong	Strong	Yes	Short	4	46	Beard	No	Light Brown.	Hard	Roundish	Yes ..	1400	3000	1:2·14	65	Fair ..	Ripens few days before Rietti.
Bobs	Yes	No ..	Late	Strong	Strong	Yes	Long	4½	57	Beardless	Yes	White	Hard	Round ..	Yes ..	1200	2800	1:2·3	64·5	Good ..	Ripens eight days before Rietti.
Late Elephant	No	Yes ..	Late	Strong	Strong	Yes	Short	4	70	Beardless when ripe	Yes	White	Hard	Roundish	?	1400	2000	1:1·85	59	Good ..	The best yielder.
Niekerk's ..	No	Yes ..	Early	Weak	Strong	Yes	Short	3½	30	Beard	Yes	White	Soft	Round ..	Excellent	1000	3000	1:3	64	Very good	Ripens twenty-one days before Rietti.
Roer Maker ..	Yes	Slightly	Late	Strong	Strong	Yes	Long	3¾	42	Beard	Yes	White	Soft	Roundish	Yes ..	1000	3000	1:3	60	?	Ripens eight days before Rietti.
Baard	No	Yes ..	Early	Strong	Strong	Yes	Short	4	42	Beard	Yes	White	Soft	Roundish	Yes ..	1000	3000	1:3	63	Very good	Earliest to ripen.
Du Toit's ..	No	Yes ..	Early	Strong	Strong	Yes	Short	4	46	Beardless	Yes	White	Soft	Roundish	Excellent	1200	3000	1:2·5	63·5	Very good	Fourteen days earlier than Rietti.
Stomp Kop Rietti	No	Yes ..	Late	Strong	Strong	Yes	Long	7½	60	Beardless	Yes	Brown	Hard	Roundish	Yes, a little dark.	1400	2600	1:1·85	..	Indiffer'nt	About as late as Rietti.
Early Elephant	Yes	Slightly	Late	Strong	Strong	Yes	Long	4½	45	Beard	Yes	Brown	Hard	Long ..	?	1200	2800	1:2·3	64·5	?	Ripens eight days before Rietti.
Rietti imported	No	Yes ..	Late	Strong	Slow	Yes	Long	5	40	Beard	Yes	Dark ..	Hard	Roundish	Yes, a little dark.	1200	3000	1:2·5	60·5	Indiffer'nt	Took rust very badly.
Jonathan ..	No	Yes ..	Late	Strong	Strong	Yes	Long	5	52	Beardless	Yes	White	Soft	Roundish	Yes ..	1000	3000	1:3	61	Good ..	Later than Rietti.
Durum ..	No	Yes ..	Late	Strong	Strong	Yes	Long	5	68	Beard	Yes	Brown	Very hard	Long ..	No ..	1200	2800	1:2·3	64	Bad ..	Strongest grower, as late as Rietti.
Darling ..	No	Yes ..	Late	Strong	Strong	Yes	Long	4½	52	Beardless	Yes	White	Hard	Round ..	Yes ..	1000	3000	1:3	65	Good ..	Ripens eight days before Rietti.
Brown Caledon Baard.	No	Yes ..	Late	Weak	Strong	Yes	Long	4½	35	Beard	Yes	Brown	Hard	Long ..	Yes ..	1000	3000	1:3	62·5	Indiffer'nt	Ripens eight days before Rietti.
French ..	No	Yes ..	Late	Strong	Strong	Yes	Long	6	53	Beard	Yes	Brown	Hard	Long ..	Yes ..	1000	3000	1:3	61·5	?	Ripens about the same as Rietti
Marshall's No. 3	No	Yes ..	Late	Weak	Poor	Yes	Short	3½	37	Beardless	Yes	White	Hard	Roundish	?	600	2900	1:4·83	..	?	Took rust very badly
Kolben ..	No	Yes ..	Late	Strong	Strong	Yes	Long	4½	60	Beard	Yes	Brown	Hard	Long ..	?	1000	3000	1:3	62·5	?	Ripens about same time as Rietti.
Federation ..	Yes	Slightly	Late	Strong	Strong	Yes	Long	4½	47	Beardless	Yes	White	Hard	Roundish	Yes ..	200	3000	1:2·5	61·5	Good ..	Ripens same as Rietti
Blue	No	Yes ..	Late	Strong	Slow	Yes	Long	4¼	53	Beardless	Yes	White	Hard	Roundish	?	1000	3000	1:3	56	?	Ripens fourteen days later than Rietti.

Oats. The following three varieties of oats, Texas, River Plate, and Appler, were tried against the standard rust-resistant variety, Algerian, to see if these, or any one of these, would prove as good, if not better, than Algerian for yield, hay, rust-resistance, or for manufacturing oatmeal, with what result can be seen by studying the attached table.

In comparing these varieties with the Algerian, we find that they were all rust-resistant in straw and ear, that River Plate and Appler had the softest straw, and that the grain of the Appler and River Plate are the heaviest per bushel, Texas coming next, and Algerian last. This is somewhat counterbalanced by the yield per acre, the Texas giving the heaviest, River Plate and Algerian about the same, and the Appler the lightest yield. The hay from all four varieties was considered good, Appler giving the softest and lightest hay. This is, however, easily understood, as the Texas gave the greatest percentage of grain to straw, 53 lbs. grain to 47 lbs. straw, and the Appler the least, 43 lbs, to 57 lbs.

These four varieties are being tested all over the Colony this season, and when the reports on these come in full data will be given.

The questions in both tables were set out in report form, and the replies were filled in by Mr. Theunissen.

CEREAL VARIETY EXPERIMENT, OATS.

Questions asked.	Algerian.	Texas.	River Plate.	Appler,
1. Rust-resistant—Yes or no ?	Yes ...	Yes	Yes	Yes
2. Rust in straw—Yes or no ?	No ...	No	No	No
3. Straw hard or soft as compared with other varieties?	Hard ...	Hard ...	Softer than other ...	Little softer than Algerian
4. Colour of straw ?... ...	Purplish...	Purplish ...	Whiter than others	Purplish
5. Quality of grain as compared with that of other varieties of oats ?	Good ...	Very good ...	Heavier than others	Heavy
6. Colour of grain as compared with that of other varieties ?...	Brown ...	Lighter than Algerian	Little browner than Algerian	Lighter colour than Algerian
7. Is grain harder than that of other varieties of oats?	No, the same as the others	No, the same as Algerian	Same as Algerian	Same as the others
8. How does the hay made from this variety compare with that made from other varieties of oats ?...	Good ...	Good, gives a heavier class than Algerian	Good hay, but softer than the others	Good, soft hay but light
9. Does it shed easily ? ...	Yes ...	Yes	Yes	Yes
10. Is it early, late or medium ?	Medium ...	Week earlier than Algerian	Week earlier than Texas	Medium
11. Average crop per acre and threshed grain ?... ...	4,000 lbs. 1,800 „	4,800 lbs. ... 2,540 „ ...	4,000 lbs. ... 1,880 „ ...	4,000 lbs. 1,720 „
12. Percentage grain to straw?	45 lbs. grain 55 „ straw	53 lbs. grain 47 „ straw	47 lbs. grain 53 „ straw	43 lbs. grain 57 „ straw
13. Does it ripen evenly ? ...	Yes ...	Yes	No	Yes
14. Does it stool well ? ...	Yes ...	Yes, very well	Yes	Best of all
15. At what stage must it be reaped ?	When ripe, for seed	When ripe, for seed	When ripe, for s ed	When ripe, for seed
16. Weight per bushel of seed ?	37 lbs. ...	39 lbs. ...	40 lbs. ...	40 lbs.

MANURIAL EXPERIMENTS WITH LUCERNE.

ROBERTSON EXPERIMENT STATION, No. 3.

By R. W. Thornton, Government Agriculturist.

During the past three seasons experiments on the manuring of lucerne on red and black Karroo soil have been conducted at the Robertson Experiment Station, by the Manager, Mr. Visser. The results obtained from the first season's experiment were unreliable, owing to the fact that the lucerne was only established that year. The second season's results were published in the *Agricultural Journal*, pages 710 and 711, of June, 1908. The tabulated results of the 1907-08 experiments are here published with the 1908-09 results for the sake of comparison, to show the striking similarity in results obtained from some of the plots.

The continued good results obtained from this experiment are especially striking in that fertilisers, applied on the surface, should so materially benefit a deep-rooted crop like lucerne. The question has repeatedly been raised as to whether surface manuring will continue to benefit this crop in an equally remarkable degree as the plants grow older and the roots go deeper. To settle this question it was necessary to repeat the experiment on the same lines as that of the previous year. The manures were again sown in July, after the ground had been wetted, and the manures were then lightly cultivated in. The first three cuts of lucerne were removed under favourable conditions, that is, there was sufficient water for the crop, but the fourth and last crop suffered somewhat from drought owing to the water supply running short on account of the abnormally dry season.

This season's results do not, on the whole, come up to those obtained last season, with the exception of farmyard manure, which shows a substantial increase, but this is probably due to the unfavourable season. The control plot and farmyard manure plot did not suffer in a like degree from drought, as the strength of the manure was probably less, or it may be due to the residual value of the farmyard manure, which the increased root system of the plants could make use of to greater advantage. The latter remark may also account for the control plot yielding a bigger return, as the root system would have gone deeper and tapped untouched material.

In the season 1907-08 five cuttings were removed, but owing to the drought only four were obtained this season, so that in comparing the two tables only the first four cuttings of season 1907-08 must be taken into account, which has been done in the diagram, but not in the tables. Even then the comparison of actual total results obtained is hardly fair, seeing that the fourth cutting taken on the 18th of January—the height of the growing season—gave a nominal yield due to want of water.

One of the greatest blessings derived from the good results obtained from this experiment is that a man with a small plot of land and a limited

water supply can, under similar soil conditions, raise almost double the crop that he could before, and so double the value of his land.

For the coming season this experiment will be continued, but no fresh fertilisers will be added to the plots, so as to ascertain if it will be possible to manure every second year and still obtain the same good results at half the cost. There seems every hope of this, as the manured plots during the past season, in this and other experiments, have remained green long after the surrounding lucerne had ceased to grow, and again started growing before the surrounding lucerne did in the Spring.

The manurial experiments are, however, being continued on fresh land for the coming season.

TABLE SEASON

No.	Fertilisers applied and quantity per acre.	Crop in pounds of Lucerne Hay per acre.						Cost of Fertiliser per acre	Increase over unmanured plot in pounds per acre.	Value of increase over unmanured Plot. Net profit at 5s. per 100 lbs. p.a.
		1st Cutting.	2nd Cutting.	3rd Cutting.	4th Cutting.	5th Cutting.	Total.	£ s. d.		£ s. d.
1	800 lbs. Superphosphate ...	3,700	6,400	4,050	3,050	3,070	20,270	1 14 0	14,640	36 12 0
2	400 lbs. Superphosphate ...	3,150	5,850	2,750	2,600	2,650	16,900	0 17 0	11,270	28 3 5
3	200 lbs. Superphosphate ...	2,590	4,070	1,750	1,400	850	10,570	0 8 6	4,840	12 2 0
4	800 lbs. Basic Slag	3,400	6,120	3,800	2,900	2,000	18,220	1 12 0	12,590	31 9 6
5	400 lbs Basic Slag	2,750	4,300	2,750	2,070	1,130	13,000	0 16 0	7,370	18 8 6
6	200 lbs. Basic Slag	1,500	2,200	850	800	550	5,900	0 8 0	270	0 13 5
7	200 lbs. Superphosphate 100 lbs. Sulphate of Potash 150 lbs. Nitrate of Soda	3,400	5,200	3,000	1,950	900	14,450	2 3 6	8,820	22 0 11
8	400 lbs. Government Guano	2,450	3,150	1,750	1,090	100	8,450	1 5 6	2,810	7 0 5
9	4,000 lbs. Farmyard Manure ...	1,600	2,300	1,600	1,000	300	6,800	1 0 0	1,170	2 18 5
10	Nil	1,230	2,090	900	740	300	5,630	...	...	...

The value of the manure and the Lucerne Hay are taken at Cape Town prices, so that railage to Robertson must be added to the cost of the manures and railage to Cape Town deducted from the value of the Lucerne Hay to arrive at the farmer's profit.

TABLE II.—SEASON 1908–09.

No.	Fertilisers applied and quantity per acre.	Crop in pounds of Lucerne Hay per acre. 1st Cutting.	2nd Cutting.	3rd Cutting.	4th Cutting.	Total.	Cost of Fertiliser per acre. £ s. d.	Increase over unmanured plot in pounds per acre.	Value of increase over unmanured plot. Net profit at 5/- per 100 lbs. £ s. d.
1	800 lbs. Superphosphate ...	4,050	5,750	4,270	2 050	16,120	1 14 0	9.590	22 5 6
2	400 lbs. Superphosphate ...	2,450	3,780	3 500	1,400	11,130	0 17 0	4,600	10 13 0
3	200 lbs. Superphosphate ...	2,250	3,750	3,030	650	9,680	0 8 6	3,150	7 9 0
4	800 lbs. Basic Slag	3,750	5,250	3,850	1,200	14,050	1 12 0	7,520	17 4 0
5	400 lbs. Basic Slag	1,550	3,950	3,450	900	9,850	0 16 0	3,320	7 10 0
6	200 lbs. Basic Slag	1,250	4,700	2,250	600	8,800	0 8 0	2,270	5 5 6
7	200 lbs. Superphosphate, 100 lbs. Sulphate of Potash, 150 lbs. Nitrate of Soda } ...	2,800	4,450	3,500	1,250	12,000	2 3 6	5,470	11 10 0
8	400 lbs. Government Guano ...	1,600	2,050	2,300	900	6,850	1 5 6	320	0 9 0
9	4000 lbs. Farmyard Manure ...	1 900	4,050	3,200	1,000	10,150	1 0 0	3,620	8 10 0
10	Nil	1,100	2,600	2,350	480	6,530	...	...	...

The value of the Manure and of the Lucerne Hay are taken at Cape Town prices, so that railage to Robertson must be added to the cost of the manures and railage to Cape Town deducted from the value of the Lucerne Hay to arrive at the farmer's profit.

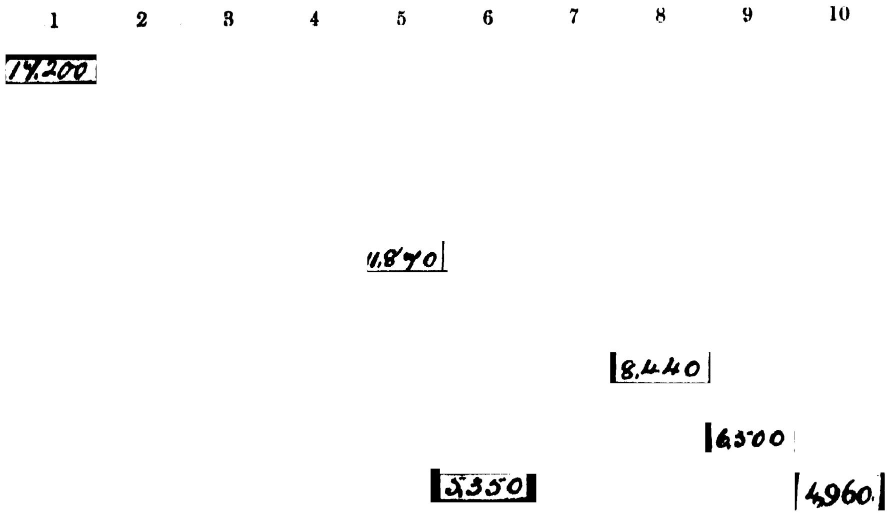
Explanation of Diagram.—The diagram represents the yields from the different plots for both seasons. As only four cuttings were obtained this season for comparison, the same number of cuttings are taken for the previous season.

The column No. 10 represents the control plot, and the columns above this represent the increased yield obtained over and above the yield of the control plot.

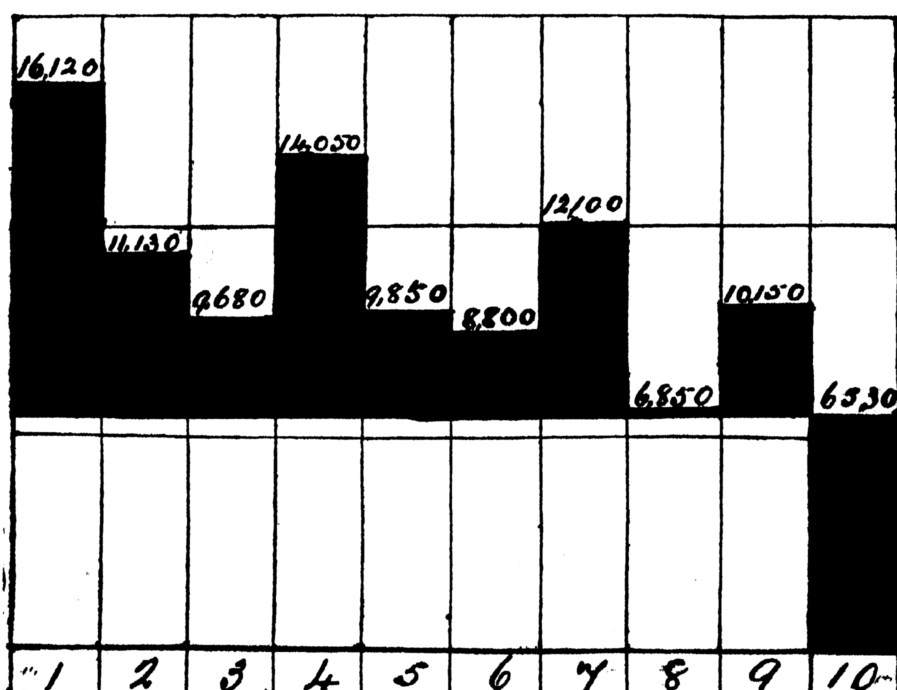
The figures given in each case represent the total yield from each plot.

Hay of sufficient value should in each case be deducted from these increases to nullify the cost of the manures; this was not done, as the price of fertilisers and hay varies in different localities.

SEASON 1907-08.

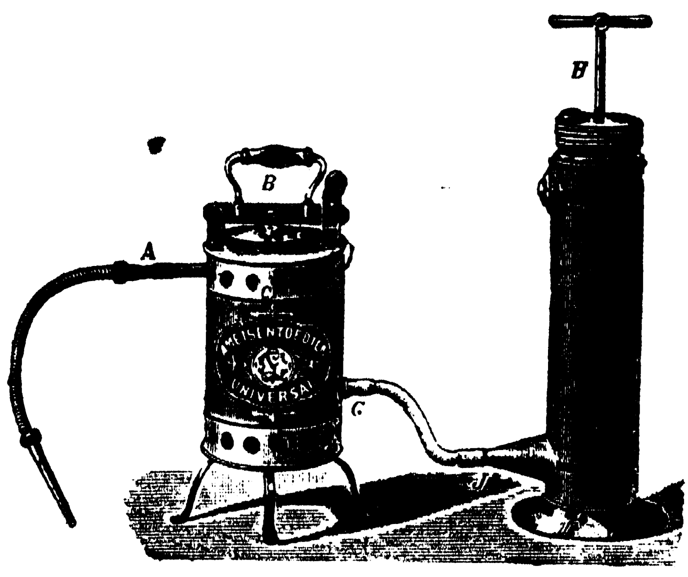


SEASON 1908-09.



DESTRUCTION OF HOUTKAPPER WHITE ANTS.

The houtkapper white ant or rijsmier is familiar to most Cape farmers, and the problem of how to prevent its depredations to growing forage is often brought up. The most commonly used remedy is the sprinkling of white arsenic around the holes it makes in the ground. In the northern colonies of recent years, other kinds of white ants have been very successfully combated by means of an appliance called the "Universal Ant Destroyer"; and as below shown its usefulness extends to the houtkapper. The machine is of a type of which many designs are on sale in South American places, where true ants are often very troublesome, but so far as I know only the one make has been introduced into South Africa. This



UNIVERSAL ANT EXTERMINATOR.—*A*, hose with spout for insertion in nest or ant-run; *B*, airtight cover; *C*, fire cylinder in which poison fumes are generated; *H*, air pump.

one was first offered in Cape Town; but there was no sale for it in this part of the country, and on my advice the firm pushed it in the Transvaal. The chief agent is S. Plaut, P.O. Box 820, Pretoria. The aparatus consists chiefly of an air pump and of a cylindrical vessel, made to close tightly, in which poisonous fumes are generated on hot coals. A short piece of hose leads from the cylinder, and at the end of it is a metal nozzle for inserting into the ant run or into the hollow of the nest. A fire is made in the cylinder, preferably with charcoal or dried dung, and a few ounces

of a poison, which can be bought of the seller of the machine, sprinkled over the hot coals. The cylinder is then closed and air forced through the apparatus with the pump. The air carries the poisonous fumes amongst the ants, and leaves a deadly deposit along the passages. The poison is white arsenic mixed with sulphur. After a minute or two all holes through which the fumes are seen to be escaping into the air should be closed and the pumping then continued for several minutes. Success, of course, depends on getting the fumes amongst the ants in sufficient strength to accomplish their destruction; and whenever practicable the nest should be found and a hole made into it through which to introduce the nozzle. If the nest is not found, the holes supposed to lead to it should be treated while the ants are actively working. Not being sure that the treatment would suffice for the houtkapper white ant, the nest of which I had never heard of anyone finding, I recently wrote to the Acting Transvaal Entomologist asking if he knew any successful experience with the apparatus in connection with this species. His reply is as follows:—

> "I have to acknowledge the receipt of your letter of the 17th instant, with reference to the Universal Ant Destroyer Machine, and in reply would state that this machine has often been used with good results in connection with the destruction of the large termites mentioned by you in your letter. Reports have also been received from farmers that the machine has been used successfully to stop the ravages of these termites on growing barley and oats.
>
> In using the Universal Ant Destroyer against the Forage-ant the following should be observed:—
>
> 1. The end of the nozzle which is inserted into the working hole of the ants should be elongated by means of a fine piece of tin, so as to bring the opening to a very fine point, and in this manner permit more effective work to be done in connection with small holes in the ground. Brown packing paper has been tried for this purpose, which answers fairly well, but it does not stand the heat and the moisture for any length of time.
>
> 2. The termites should only be treated when working energetically, which has been found to be the case during the afternoon of a cloudy day before a change of weather occurs; the working channels will then be found to be well open and the arsenical fumes can be driven deep into the nest.
>
> A queen has been found after spending the best part of a day in digging for her, but unfortunately the natives who assisted in this work were rather careless and squashed the queen into a useless pulp."

The term "termites" refers to white ants. These creatures are really not true ants, to which insects they are less related than to locusts. Many kinds of true ants can be readily destroyed in their nests and runs with the aid of the apparatus, but the measure is not at all applicable to the imported, small, dark coloured house ant (*Iridomyrmex humilis*) that has of late years become a decided nuisance in and about many colonial towns.

REGISTERED COMMERCIAL FERTILISERS.

By C. F. Juritz, M.A., D.Sc., F.I.C., Senior Government Analyst.

The following is a list of all commercial fertilisers which have been registered for sale during the present calendar year in this Colony under the provisions of "The Fertilisers, Farm Foods, Seeds, and Pest Remedies Act," No. 20 of 1907.

The composition of each article, as it is stated in the subjoined list, is simply that guaranteed by the persons who registered it, and the present publication of the figures must not in any way be construed as a confirmation of their correctness on the part of this Department.

As the law has but recently come into operation, permission has in certain cases been allowed for the use of terms which it would be undesirable to continue. In connection with some superphosphates, for instance, the registration of numbers—generally misleading, although quite unintentionally so—purporting to indicate phosphate percentage, affords an illustration of a rather loose practice which it is one of the objects of the present law to terminate. The adoption of such terms as "No. 1 Superphosphates," or "Superphosphate, Class A," or else "high grade," "medium grade" and "low grade superphosphates" is greatly to be preferred, for both scientific and practical reasons. Another undesirable and unscientific practice, the perpetuation whereof should not be encouraged, is the employment of recognised terms of well-defined meaning—like "guano"—to indicate articles wholly different in character and origin to what is generally understood by such expressions.

In the list below the several fertilisers are arranged as far as possible, in classes, according to their nature and general character. The following abbreviations are used in the last two columns to denote the materials from which the fertilisers are stated by the vendors to have been derived: Al. (Albuminoid), A. (Ammonical), B. (Bone), Bl. (Blood), Cl. (Chloride or Muriate), F. (fish), G. (Guano), N. (Nitric, or Nitrate), O. (organic), Sul. (Sulphate).

I. GUANOS AND OTHER NATURAL FERTILISERS.

Manufacturer, Vendor, or Importer.	Name of Fertiliser.	Brand of Fertiliser.	Phosphoric Oxide. Water soluble %.	Phosphoric Oxide. Citrate soluble %.	Phosphoric Oxide. Total %.	Nitrogen %.	Potash %.	Lime %.	Form in which nitrogen is present.	Form in which potash is present.
Colonial Government, Cape Town	Guano	Government Guano	4·71	12·12	12·20	10·04	2·25	10·54	G.	O.
S. A. Fertilisers Co., Durban, Natal.	Safco Fish guano	Safco	...	2·5	13	5	...	18	F.	...
,, ,,	Safco phosphatic guano ...	,, ...	...	12·75	26·75	·5	...	35	G.	...
II. BASIC SLAG, THOMAS PHOSPHATE, &C.										
Woodbead, Plant & Co., Cape Town.	Thomas phosphate powder ...	Hout Kop	...	14·59	16·40	...	...	51·91	...	...
Blaine & Co., Port Elizabeth ...	Thomas phosphate powder ...	H. & E. Albert ...	...	15·21	17·03	...	...	43·2	...	...
Rood, Penberthy & Co., Malmesbury.	Basic slag	Rood, Penberthy & Co.	...	16·11	18·32	...	...	26·84	...	...
S. A. Fertilisers Co., Durban, Natal.	Safco basic slag	Safco	...	16	20	...	...	45	...	...
III. SUPERPHOSPHATES.										
Woodhead, Plant & Co., Cape Town.	Superphosphate	Hout Kop	12·55	12·93	14·08	...	...	16·66	...	...
R. Wilson, Son & Co., Cape Town	Odam's superphosphate 26/28%	Odam's (Phœnix)...	11·90	12·35	12·35	...	...	15·00	...	...
,, ,,	,, ,, 30/32%	,, ,, ...	13·74	14·19	...	...	...	14·00	...	...
,, ,,	,, ,, 35/37%	,, ,, ...	16·04	16·49	16·49	...	...	20·00	...	...
S. Efroiken, Bellville	Superphosphate	Par excellence ...	12·80	13·41	13·59	...	...	16	...	...
,, ,, ...	Superphosphate 37/41% ...	,, ...	17·55	18·44	18·55	...	...	22	...	...
Dyer & Dyer, Ltd., East London	Superphosphate	Star	16·67	...	16·67	...	...	19·64	...	...
N. A. Smit, Malmesbury ...	No. 1 superphosphate... ...	No 1.	17·93	18·77	18·92	...	...	22·3	...	...
A. Newmark, Napier	(a) Superphosphate	Albatross	12·45	13·10	13·10	...	...	15·6	...	...
,, ,, ...	(b)	Joode Guano ...	17·95	18·70	19·10	...	...	22·5	...	...

Griffiths & Co., Port Elizabeth	Ohlendorff's supershosphate...	Cornucopia ...	13·74	...	14·2	...	...	16·8	...	...
S. Will, Elim	Superphosphate 28/30% ...	Albatross	13·45	13·95	14·20	...	...	16·55	...	...
" "	" 38/40% ...	"	17·70	18·40	18·90	...	...	22·10	...	...
M. Kahn, Warren's Camp Siding	" 26/28% ...	"	12·50	12·90	13·20	...	...	15·15	...	...
" " "	" 36/38% ...	"	16·60	17·30	17·70	...	...	20·05	...	...
S. Will, Elim	" 40% ...	Will's	16·81	17·03	17·21	...	...	...	...	...
" "	" 30% ...	"	12·56	13·17	13·41	...	...	...	...	...
Mackie, Dunn & Co., Port Elizabeth.	" 35% ...	Odam's	16·04	16·49	16·49	...	...	20·00	...	...
S. A. Fertilisers Co., Durban, Natal.	Safco High grade superphosphate.	Safco	17	17·5	18	...	...	30	...	...
" "	Safco ordinary grade superphosphate.	"	11·75	12·25	13·75	...	...	30	...	...
Bennet & Louw, Bredasdorp ...	Superphosphate	Du Toit's Guano ...	18·00	18·80	19·20	...	...	22·15	...	...

IV. DOUBLE SUPERPHOSPHATES.

S. A. Fertilisers Co., Durban, Natal.	Safco Double superphosphate	Safco	42	45·75	46	...	...	45	...	...

V. DISSOLVED BONES, VITRIOLISED BONES, &c.

R. Wilson, Son & Co., Cape Town	Odam's vitriolised bones (pure dissolved bones).	Odam's (Phœnix)...	5·49	...	14·65	2·49	...	17·34	B.	...
Griffiths & Co., Port Elizabeth	Ohlendorff's vitriolised bones	Cornucopia ...	7·32	...	14·65	2·67	...	17·34	B.	...
Mackie, Dunn & Co., Port Elizabeth.	Vitriolised bones	Odam's	5·49	...	14·65	2·47	...	17·34	B.	...
S. A. Fertilisers Co., Durban, Natal.	Safco pure dissolved bones ...	Safco	6·75	11·25	16·5	2·5	...	20	B.	...

VI. STEAMED BONES.

Griffiths & Co., Port Elizabeth	Ohlendorff's steamed bone flour	Cornucopia ...	...	...	29·77	·82	...	35·23	B.	...
S. A. Fertilisers Co., Durban, Natal.	Safco steamed bone flour ...	Safco	...	15	30	1	...	35	B.	...

VII. BONE MEAL.

Manufacturer, Vendor, or Importer.	Name of Fertiliser.	Brand of Fertiliser.	Phosphoric Oxide. Water soluble %.	Phosphoric Oxide. Citrate soluble %.	Phosphoric Oxide. Total %.	Nitrogen %.	Potash %.	Lime %.	Form in which nitrogen is present.	Form in which potash is present.
Stewart & Co., Upper Paarl ...	Pure bone meal	Force	...	5·69	22	3·4	...	28	B.	...
Dyer & Dyer, Ltd., East London	Bone meal	Star	...	...	29·77	·82	...	...	B.	...
P. Ryan, Cape Town	Pure ground bone	Os Kop	...	...	21	3·75	...	...	B.	...
S. A. Fertilisers Co., Durban, Natal.	Safco bone dust	Safco	...	8	23	3·75	...	28	B	...
VIII. BLOOD MANURE.										
S. A. Fertilisers Co., Durban, Natal.	Dried blood meal	Safco	...	...	...	11	...	...	Bl.	...
IX. KAINIT.										
Griffiths & Co., Port Elizabeth	Ohlendorff's Kainit	Cornucopia ...	...	...	...	...	10	...	...	Sul. & Cl.
X. POTASH SALTS.										
Dyer & Dyer, Ltd., East London	Muriate of potash	Star	...	...	...	...	62·14	...	...	Cl.
S. A. Fertilisers Co., Durban, Natal.	Safco muriate of potash ...	Safco	...	...	...	...	60	...	...	Potash salts
Griffiths & Co., Port Elizabeth	Ohlendorff's sulphate of potash	Cornucopia ...	...	...	...	...	50	...	...	Sul.
S. A. Fertilisers Co., Durban, Natal.	Safco sulphate of potash ...	Safco	...	...	...	...	50	...	...	Potash salts
" "	Safco nitrate of potash ...	"	...	...	...	13	44	...	N.	Potash salts

XI. NITRATE OF SODA

Dyer & Dyer, Ltd., East London	itrate of soda ...	Star	..	
Griffiths & Co., Port Elizabeth	" " ...	Cornucopia ...	..	
S. A. Fertilisers Co., Durban, Natal.	afco nitrate of ...	Safco	..	

X

Dyer & Dyer, Ltd., East London	Sulphate ammonia	r	20	A
S. A. Fertilisers Co., Durban, Natal.	Safco sul ate of ammonia	co	20	A

X MIXED FERTILISERS

D.	special fertiliser ...	Hockly's ...	8·24	...	9·16	3·29	2·00	...	O. & A.	Sul
R.	Odam's complete fertiliser	Odam's (Phœnix)	8·24	...	10·5	3·3	2·00	12·46	O. & A.	Cl
	Odam's special potato fertil	" "	6·42	...	7·78	3·7	3·00	9·21	O. & A.	Cl
	Odam's vine fertiliser	" "	7·32	...	8·71	2·00	4·00	10·30	O. & A.	Cl
ffith Port El beth	Ohlendorff's tobacco fertil	Cornucopia	5·03	...	9·16	4·11	5	10·84	O. & A.	Su
"	Ohlendorff's potato fertiliser	"	7·32	...	9·16	3·29	3	10·84	O. & A.	Su
"	Ohlendorff's cotton fertiliser	"	5·49	...	9·16	4·94	3	10·84	O. & A.	Sul
W. Whitehead & Co Po Elizabeth.	Odam's complete manure ...	Odam's ...	8·24	..	10·5	3·3	2·0	12·46	O. & A.	Cl
Ryan, Cape Town	Vin , tree and general fertiliser	Os Kop ...	...	...	10	2·5	3·5	12	O. & N.	Kraal
" "	Potato and general garden fertiliser.	" ...	...	...	8	3	4·5	11·5	O. & N.	Kraal
Smuts & Koch, Malm	Limphos	D. de Pass & Co.	7·00	13·00	18·50	...	...	35·00	...	..
"	Cereal manure...	"	10·50	11·50	13·00	3·30	1·60	22·00	O., N. & A.	Su
Mackie, Dunn Po Elizabeth.	Special potato fertiliser ...	Od n's	6·42	...	7·78	3·7	3·0	9·21	O. & A.	Cl
	plete fertiliser		8·24	...	10·5	3·3	2·0	12·46	O. & A.	Cl
"	ine fertiliser	"	7·32	...	8·71	2·00	4·00	10·30	O. & A.	C
S. A. Trading Co., Cape To	pecial potato fertiliser ...	Oh ndorff	7·32	...	9·16	3·29	3·0	10·8	O. & A.	Su
"	pecial vine fertiliser ...		7·32	..	9·16	2·05	4	10·8	O. & A.	Su

XIII. MIXED FERTILISERS—*continued.*

Manufacturer, Vendor, or Importer.	Name of Fertiliser.	Brand of Fertiliser.	Phosphoric Oxide.			Nitrogen %.	Potash %.	Lime %.	Form in which nitrogen is present.	Form in which potash is present.
			Water soluble %.	Citrate soluble %.	Total %.					
S. A. Fertilisers Co., Durban, Natal.	Safco autumn citrus fertiliser	Safco	11	...	12	...	15	12	...	Sul.
" "	Safco summer citrus fertiliser	"	8·25	...	8·5	3·5	10	11	N.	N. & sul.
" "	Safco spring citrus fertiliser	"	7	...	7·5	5·5	9	10	N.	N. & sul.
" "	Safco double complete fertiliser	"	20	21	24	8	10	22	A. & N.	N.
" "	Safco vine fertiliser	"	8·25	9·25	12·5	3	6	16	A. & Al.	Cl.
" "	Safco garden fertiliser ...	"	6·5	9	12·5	3	6	16	A., N. & Al.	N. & sul.
"	Safco lucerne fertiliser ...	"	11	11·75	13	1	6	18	Al.	Cl.
" "	Safco cotton fertiliser ...	"	10	10·5	12	3·5	4	15	A. & Al.	Sul.
" "	Safco tea fertiliser	"	7·5	8·5	12	4	4	15	A. & Al.	Sul.
" "	Safco sugar cane fertiliser ...	"	9	9·5	10	5	9	12	A. & Al.	Cl.
" "	Safco tobacco fertiliser ...	"	9	9·75	12	3	11	15	N.	N.
" "	Safco root fertiliser	"	11	11·75	13	2·5	1·5	18	A. & Al.	Cl.
" "	Safco mealie fertiliser ...	"	9	10	12·5	2·5	1·5	16	A. & Al.	Cl.
" "	Safco potato fertiliser ...	"	8·25	9·25	12	4	3	15	A. & Al.	Sul.
" "	Safco dissolved bone compound	"	11·5	13·5	16	1·5	...	20	B. & Al.	...
" "	Safco dissolved bone compound, No. 2.	"	9	11	13·75	1	...	20	B. & O.	...
" "	Safco grain fertiliser	"	10	11	12	5	1·5	15	A. & Al.	Cl.
Baker, Baker & Co., King William's Town.	General fertiliser	BB.	...	4·94	10·81	1·48	11·08	50·22	N.	N.
Malcomess & Co., Ltd., East London.	Malcomess "A" fertiliser ...	"A"	6·52	..	6·52	4·25	10·02	...	A.	Potash salts

THE WINE INDUSTRY OF CAPE COLONY.

LORD BLYTH'S REPORT.

The following is Lord Blyth's report on the Wine Industry:—

I must preface my notes on the Cape Wine Industry by stating that when I was paid the compliment of being asked to visit South Africa and confer with the members of the Government on Viticulture I had no knowledge of the large accumulations of stocks of Wine that existed in the Colony, and it was only on landing in Cape Town on the 13th April last that I was made aware of the agitation that was then taking place throughout the wine-growing districts, and of the meeting of the farmers which was to be held on the day following my arrival.

I was simply under the impression that in view of the possible early unification of South Africa the Government were wisely anticipating the development of all the resources of the Colony, and amongst them the Wine Industry, which, notwithstanding the undoubted suitability of the soil and climate for the cultivation of the grape, had, I imagine, been somewhat neglected of late, seeing that practically no Cape wines had been exported to the United Kingdom for many years past.

Had there been no immediate difficulties to meet in the shape of the large surplus stocks of Colonial wines and brandies now in the hands of the farmers or the Government, for which there are so few outlets at the present moment in any part of the world, I cannot but feel that my experience of fifty years in the European wine business, together with my knowledge of the Cape wine trade in England previous to the equalisation of duties in 1860, might have been of more service to the Government than it can possibly be at this critical juncture.

During my visits to the various vine-growing districts of Cape Colony I have seen no reason for changing the opinion I formed the first few days I was in Cape Town, viz.:—that natural wines, both white and red, can be produced in many localities of a sufficiently good quality to satisfy the wants of a large proportion of the wine-drinking population of South Africa, and also that there is a prospect of a limited quantity of wines of the Port wine type being exported for consumption in other parts of the Empire.

As is the case, however, with nearly every wine-producing country, it is the home market that must be looked to as the outlet for the bulk of the wine produced in South Africa.

Of the 1,250 million gallons of wine produced in France annually only 40 per cent., or one twenty-fifth part is exported to other countries of the world, even a smaller proportion is exported from Italy, the second largest wine-producing country.

It is therefore manifestly of far greater importance to turn attention to the encouragement of the consumption of wines at Home than abroad, and not only to see that they are produced under the most favourable conditions, but also that they are thoroughly matured in cask and bottle, so that they reach the consumer in the highest state of perfection.

In former times when Cape wines were no doubt all more or less fortified with brandy at or soon after the vintage, as in Spain and Portugal, the same careful attention was not required as it would be when they are kept quite natural, as at the present time.

Cool underground cellars are as essential as the grapes themselves for producing light wines of high quality, and this will be recognised if one bears in mind that while the "Lodges" of Portugal and the "Bodegas" of Spain are all above ground, one never sees the light natural clarets and burgundies of France nor the hocks and moselles of Germany stored above ground, but in cool underground cellars where the temperature is low and never varies between summer and winter.

And, if we except Australia—which has of late supplied the United Kingdom with a certain quantity of natural wine, but at a comparatively high strength of alcohol—no country has successfully supplied us with natural light beverage wines but France and Germany.

Although Italy produces some seven hundred million gallons of wine annually so close to our own shores, the consumption of Italian wines with us is infinitesimally small, much as they are appreciated by Englishmen in the country of their production.

The more I reflect on the wine industry of Cape Colony, the more certain I feel that with the Orange River Colony, the Transvaal, Natal and Rhodesia forming one large and prosperous country, the Cape wine trade, if conducted on sound commercial principles and wisely supported by the Government, will be far more responsive to any assistance given for its development at home than if tenfold the sacrifice were made to establish a wine trade abroad. At the same time I do not wish to altogether discourage an attempt being made to re-introduce Cape wines into the United Kingdom and also to obtain a footing in other non-wine-producing parts of the British Empire, particularly as I have reason to believe that some of the Cape wines have special health-giving qualities that the wines of other countries do not possess, and if I could assist to bring about so desirable a result as even a small demand for Cape wines in England, it would be a real pleasure and labour of love to me.

I should perhaps add that I commenced my commercial career at a time when there was an important sale of Cape wines in England, and, with my relatives, took part in their introduction and distribution to the British public, and I should indeed be proud if I could in any way assist in the revival of the trade.

As neither Cape wines nor Cape brandies have been before the British public for many years, I am most anxious that none should be shipped to England but such as are the best specimens of the country and perfectly fermented and in the best condition for early consumption after arrival. It would injure the Cape wine and brandy trade for another generation if either wines or brandies which did not bear a favourable comparison with similar descriptions of wines or spirits produced in Europe—which, unfortunately for South Africa, were never produced so bountifully or at such low prices as at the present time—were shipped to the United Kingdom.

I have seen with pleasure the many wineries that have been erected in Cape Colony during the last few years, and although I do not doubt that they have been the means of a far better quality of wine being produced than that which the small wine farmers would have been likely to make themselves, I nevertheless feel that the wine itself coming from these wineries cannot be of the highest class, but should be rather considered

the ordinary, though pure, beverage wine of the country. There cannot reasonably be the careful selection of grapes picked at the exact moment of ripeness that go to these wineries, the desire of the farmer being naturally to produce quantity rather than quality. I am inclined to think, therefore, that the superior wines will always be made on the estates where the grapes are not only gathered and pressed, but the wine retained there until such time as the fermentation is complete, and better still if stored at the vineyards in cool underground cellars until thoroughly matured and ready for shipment or bottling, but failing this great guarantee of excellence I have no doubt that the wineries system is the next best method for procuring average good quality.

Assuming that you can ensure average good quality of natural beverage wines, thoroughly matured and fit for consumption, the next question of importance is the distribution, and here I think the Government can render greater assistance even than in providing capital for the erection of wineries.

The first cost of the wines produced in Cape Colony, judged by the value of the grapes at the present time as throughout Europe, is little more than the value of beer, but yet owing to the limited sale the price asked by the hotel proprietor or restaurateur is some three or four times that of malt liquors, and there is less cause for this disparity in price seeing that while the wine is free from duty—the grape being produced in the Colony—beer pays a tax because the barley and other ingredients are imported.

It seems to me that the future Government of the Union could render a great service to the wine industry of South Africa in setting an example by instituting a system whereby both red and white natural wines of good marketable quality and in perfect maturity for consumption could be obtained at all railway stations and restaurant cars, or wherever the Government has jurisdiction, at a low fixed price per bottle, the same to bear the Government official stamp as a guarantee of genuineness. This would compel all other sources of supply to reduce their prices proportionately, which would without doubt lead to a large consumption of Colonial wines, and at the same time cause them to be favourably known by travellers in South Africa of every nationality.

From the meeting of the South African National Union at Kimberley, and from conversations I have had with representative men in the different Colonies, I fear there is a strong-rooted objection to encouraging the consumption of wine amongst the inhabitants, and particularly amongst the coloured races. This is all owing to the want of knowledge that prevails amongst well-meaning people as to the great difference between natural wines and fortified wines.

All our foremost British statesmen for the last half century recognised the great distinction between wines that only contain the alcohol which has been generated in them by the conversion of the saccharine in the grape, and wines to which brandy has been added, and in France they are always designated by different names, viz: "Vin Naturel" and "Vin de Liqueur." It would, I believe, be impossible for anybody, be he black or white, to become intoxicated by drinking natural wine, and all our great legislators, such as John Bright, Cobden, Disraeli, and Gladstone have recognised their health-giving properties and availed themselves of every opportunity of advocating their consumption on the score of temperance.

There is no more sober nation than France, and yet with a total population of 40 millions the average consumption per head is considerably over one hundred bottles of natural wine per annum, and the feeling prevails to-day more strongly than ever, both in France and England, that

natural wines, rather than beer or any other stimulant, are indispensable to the health of those of sedentary habits.

In face of the many obstacles which beset the wine farmer in almost every vine-growing country, and the plethora of wine that exists at the present time throughout Europe, I would suggest whether it would not be more profitable for the agriculturist of the future, not only in South Africa but in other grape-growing countries, to turn his attention to the cultivation of grapes for export in their natural state, or preserved as raisins, for which there is an ever increasing demand in every part of the world. This trade in both fresh and preserved fruit has been brought to a high state of perfection in the south-east of Spain, and is fast becoming of more importance to the Spanish nation than the export of wines.

The obstacles to the export of wine from every country are increasing year by year, for not only are there heavy duties in Great Britain, as well as in all foreign countries, but also heavy Excise licences which are frequently difficult if not impossible to obtain, and are, therefore, an ever-present barrier to the extension of the wine trade.

Another great barrier to the extension of trade in wines and spirits, which is absent from all other branches of commerce, is the common custom of charging a large fixed sum for an annual licence. If this licence tax could be fixed proportionately to the extent of the merchant's trade, it would be more equitable to the merchant, whether his trade be large or small.

For the sale of pure natural wines only, the produce of Cape Colony, I would strongly recommend that a special licence be granted, entirely apart from that issued in respect of fortified wines and spirits, either home-made or imported, and that this special natural wine licence be obtainable by any applicant of known respectability at quite a nominal price or registration fee. This would be a further encouragement for merchants to trade in natural home-made wines only, and in my opinion nothing but good would result therefrom.

In conclusion, I should like to observe that after many inquiries in my travels through the Cape Colony and neighbouring states, which I hope will soon constitute the South African Union, I see a much brighter future for all engaged in every branch of agriculture other than viticulture, and I trust, therefore, that a way may be found to give generous assistance to the wine farmers in their present plight, recognising as I do that the restrictive measures placed by successive Parliaments upon the wine and spirit industry have in no small degree been the cause of the painful position in which they new find themselves placed.

CAPE PRODUCE CONDEMNED IN THE TRANSVAAL.

Return of Vegetable Produce from Cape Colony, condemned by Transvaal Plant Inspectors at Johannesburg and elsewhere during the months of March and April, 1909.

Pears.

March 2.—L. C. Brown, Klapmuts, 11 packages, Codling moth, 2 per cent. Reconsigned.

March 3.—P. C. Burger, De Doorns, 1 package, Codling moth, 8 per cent. Destroyed.

March 4.—P. C. Burger, De Doorns, 1 package, Codling moth, 17·9 per cent. Destroyed.

March 2.—B. Cohen, Wynberg, 14 packages, Codling moth, 4·40 per cent. Reconsigned.

March 2.—J. H. T. de Villiers, Simondium, 60 packages, Codling moth, 2·34 per cent. Reconsigned.

March 8.—Du Toit, Huguenot, 3 packages, Codling moth, 4 per cent. Reconsigned.

March 5.—Fouche, Hex River, 7 packages, Codling moth, 10 per cent. Destroyed.

March 8.—Gie Bros., Hex River, 10 packages, Codling moth, 2 per cent. Destroyed.

March 5.—Mrs. Munros (passenger), 1 package, Codling moth, 5·1 per cent. De-

March 17.—King, Hex River, 1 package, Codling moth, 10 per cent. Destroyed.

March 18.—Malleson, Stellenbosch, 9 packages, 4 per cent. Destroyed.

March 22.—T. Micklem, Stellenbosch, 21 packages, 56 per cent. Destroyed

March 30.—Naidoo, Robertson, 2 packages, Codling moth, 21 per cent. Destroyed.

March 3.—Pickstone and Arton, Groot Drakenstein, 27 packages, Codling moth, 5·40 per cent. Reconsigned.

March 8.—Pickstone and Arton, Groot Drakenstein, 63 packages, Codling moth, 4 per cent. Reconsigned.

March 9.—Pickstone and Arton, Groot Drakenstein, 29 packages, Codling moth, 1·25 per cent. Reconsigned.

March 1.—Stein (passenger), 1 package, Codling moth, 15 per cent. Destroyed.

March 1.—Stofberg (passenger), 1 package, Codling moth, 12 per cent. Destroyed.

March 16.—Western Fruit Supply, Worcester, 17 packages, Codling moth, 1·5 per cent. Reconsigned.

Peaches.

March 6.—O. C. M. Barry, Stellenbosch, 6 packages, Codling moth, 10 per cent. Reconsigned.

March 27.—O. C. M. Barry, Stellenbosch, 5 packages, fruit fly, 30 per cent. Destroyed.

March 25.—P. C. Burger, De Doorns, 1 package, fruit fly, 50 per cent. Destroyed.

March 22.—P. C. Burger, De Doorns, 2 packages, fruit fly, 8·28 per cent. Destroyed.

March 2.—Cape Orchard Co., 6 packages, Codling moth, 50 per cent. Destroyed.

March 8.—Cape Orchard Co., 15 packages, Codling moth, 1·36 per cent. Reconsigned.

March 8.—Cape Orchard Co., 15 packages, Codling moth, 6·46 per cent. Reconsigned.

March 8.—Cape Orchard Co., 20 packages, Codling moth, 4 per cent. Reconsigned.

March 12.—Cape Orchard Co., 150 packages, Codling moth, 1½ per cent Reconsigned.

March 23.—Du Toit, Stellenbosch, 31 packages, fruit fly, 26 per cent. Destroyed.

March 5.—E. W. Pearse, Simondium, 6 packages, Codling moth, 1·44 per cent. Reconsigned.

March 17.—Rhodes Fruit Farms, 21 packages, fruit fly, 20 per cent. Reconsigned.

March 2.—Steenkamp, Hex River, 11 packages, Codling moth, 7 per cent. Destroyed.

March 2.—Steenkamp, Hex River, 38 packages, Codling moth, 4·4 per cent. Destroyed.

March 5.—Steenkamp, Hex River, 2 packages, Codling moth, 1·75 per cent. Reconsigned.

March 6.—Steenkamp, Hex River, 41 packages, Codling moth, 3·75 per cent. Destroyed.

March 1.—Schaenberg (passenger), 1 package, Codling moth, 12½ per cent. Destroyed.

Apples.

March 17.—S. W. Akoo, Worcester, 5 packages, Codling moth, 3½ per cent. Reconsigned.

March 22.—S. W. Akoo, Worcester, 7 packages, Codling moth, 3 per cent. Reconsigned.

March 8.—H. Bower, Lategan, 6 packages, Codling moth, 1½ per cent. Reconsigned.

March 2.—A J. Brink, 3 packages, Codling moth, 2·2 per cent. Reconsigned.

March 9.—J. Brink, Wellington, 17 packages, Codling moth, 1½ per cent. Reconsigned.

March 8.—B. Cohen, Wynberg, 22 packages, Codling moth, 1½ per cent. Reconsigned.

March 18.—B. Cohen, Wynberg, 13 packages, Codling moth, 2·16 per cent. Reconsigned.

March 10.—M. C. Conroy, Paarl, 3 packages, Codling moth, 4 per cent. Reconsigned.

March 3.—S. Cotzias, Bosmans Crossing, 18 packages, Codling moth, 4·4 per cent. Reconsigned.

March 15.—J. H. T. de Villiers, 5 packages, Codling moth, 6 per cent. Reconsigned.

March 15.—J. H. T. de Villiers, 8 packages, Codling moth, 2½ per cent. Reconsigned.

March 8.—Du Toit, Huguenot, 16 packages, Codling moth, 1½ per cent. Reconsigned.

March 15.—J. J. Hill, Groot Drakenstein, 25 packages, Codling moth, 2 per cent. Reconsigned.

March 8.—J. Hugo, French Hoek, 25 packages, Codling moth, 1·9 per cent. Reconsigned.

March 18.—D. J. Joubert, Ceres Road, 17 packages, Codling moth, 2 per cent. Reconsigned.

March 29.—C. W. H. Kohler, Cillie, 14 packages, Codling moth, 2 per cent. Reconsigned.

March 24.—S. C. Kos, Worcester, 7 packages, Codling moth, 4 per cent. Reconsigned.

March 10.—D. D. Marais, Simondium, 25 packages, Codling moth, 13 per cent. Reconsigned.

March 19.—D. D. Marais, Simondium, 14 packages, Codling moth, 4½ per cent. Reconsigned.

March 22.—D. D. Marais, Simondium, 47 packages, Codling moth, 4½ per cent. Reconsigned.

March 24.—D. D. Marais, Simondium, 20 packages, Codling moth, 5·4 per cent. Reconsigned.

March 25.—D. D. Marais, Simondium, 38 packages, Codling moth, 2¾ per cent. Reconsigned.

*March 22.—J. Minnaar, Worcester, 15 packages, Codling moth, 2½ per cent. Reconsigned.

March 24.—J. Minnaar, Worcester, 10 packages, Codling moth, 2 per cent. Reconsigned.

March 25.—J. Minnaar, Worcester, 11 packages, Codling moth, 6 per cent. Reconsigned.

March 26.—J. Minnaar, Worcester, 22 packages, Codling moth, 2 per cent. Reconsigned.

March 12.—H. Myburgh (passenger), 1 package, Codling moth, 60 per cent. Destroyed.

March 24.—Naidoo, Robertson, 15 packages, Codling moth, 1·1 per cent. Reconsigned.

March 26.—Naidoo, Robertson, 20 packages, Codling moth, 3 per cent. Reconsigned.

March 30.—Naidoo, Robertson, 2 packages, Codling moth, 1·2 per cent. Reconsigned.

March 10.—Nicholson, Stellenbosch, 2 packages, Codling moth, 2 per cent. Destroyed.

March 8.—A. P. Pepler, French Hoek, 30 packages, Codling moth, 4 per cent. Reconsigned.

March 6.—Pillay and Co., Heidelberg, 29 packages, Codling moth, 2·1 per cent. Reconsigned.

March 26.—A. Poole, French Hoek, 16 packages, Codling moth, 2·3 per cent. Reconsigned.

March 2.—J. H. Postlethwaite, Bosman's Crossing, 26 packages, Codling moth, 2·13 per cent. Reconsigned.

March 13.—F. Richards, Huguenot, 1 package, Codling moth, 11 per ecnt. Reconsigned.

March 17.—Rhodes Fruit Farms, 26 packages, Codling moth, 2 per cent. Reconsigned.

March 29.—T. Roux (passenger), 1 package, Codling moth, 15 per cent. Destroyed.

March 2.—V. Sammy, Kimberley, 30 packages, Codling moth, 1·35 per cent. Reconsigned.

March 17.—Sulliman, Worcester, 9 packages, Codling moth, 3½ per cent. Reconsigned.

March 27.—Sulliman, Worcester, 5 packages, Codling moth, 3 per cent. Reconsigned.

March 26.—Sulliman, Worcester, 8 packages, Codling moth, 3 per cent. Reconsigned.

March 23.—Sulliman, Worcester, 17 packages, Codling moth, 2 per cent. Reconsigned.

March 13.—Western Fruit Supply, Worcester, 17 packages ,Codling moth, 3 per cent. Reconsigned.

March 17.—Western Fruit Supply, Worcester, 25 packages, Codling moth, 10 per cent. Reconsigned.

March 18.—Western Fruit Supply, Worcester, 10 packages, Codling moth, 6·1 per cent. Reconsigned.

March 17.—C. E. Wolliston, 1 package, Codling moth, 15 per cent. Destroyed.

*March 22.—Groot Drakenstein Vineyard Co., 35 packages, Codling moth, 2½ per cent. Reconsigned.

*March 22.—J. Minnaar, Worcester, 15 packages, Codling moth, 1¾ per cent. Reconsigned.

March 22.—S. Gells, King William's Town, potatoes, 13 packages, nectria solani, 2 per cent. Reconsigned.

March 4.—S. Macaulay (passenger), pears and apples, 1 package, Codling moth, 19·13 per cent. Destroyed.

March 16.—McRennie and Co., Cathcart, eating potatoes, 23 packages, bicelus solanaceavum, 10 per cent. Reconsigned, condemned at Pretoria.

March 30.—Naidoo, Robertson, quinces, 1 package, Codling moth, 9 per cent. Reconsigned.

March 10.—Nicholson, Stellenbosch, nectarines, 3 packages, fruit fly, 87½ per cent. Destroyed.

*March 19.—H. Otto, Worcester, quinces, 1 package, Codling moth, 3 per cent. Destroyed.

March 31.—Pillay, Heidelburg, quinces, 23 packages, Codling moth, 1¼ per cent. Reconsigned.

March 2.—P. v. d. Merwe, Wellington, grapes and peaches, 2 packages, rotten. Destroyed.

March 3.—French Hoek, apples and peaches, 1 package, Codling moth, 60 per cent. Destroyed.

Apples.

April 6.—S. Akoo, Worcester, 7 packages, Codling moth, 3 per cent. Reconsigned.

April 13.—P. A. Black, De Doorns, 45 packages, Codling moth, 3 per cent. Reconsigned.

April 14.—Devine and Co., Paarl, 12 packages, Codling moth, 2½ per cent. Reconsigned.

April 7.—S. W. Joubert, Ceres Road, 6 packages, Codling moth, 18 per cent. Reconsigned.

April 21.—D. J. Joubert, Ceres Road, 26 packages, Codling moth, 1·1 per cent. Reconsigned.

*Condemned at Pretoria.

April 14.—M. A. Ponday, 5 packages, Codling moth, 1·3 per cent. Reconsigned.

April 5.—A. S. Roux, Worcester, 4 packages, Codling moth, 6 per cent. Abandoned and destroyed.

April 14.—A. S. Roux, Worcester, 84 packages, Codling moth, 3 per cent. Reconsigned.

April 10.—J. J. Scholts, Lategan, 5 packages, Codling moth, 1·3 per cent. Reconsigned.

April 29.—J. Shapiro, Huguenot, 8 packages, Codling moth, 2·7 per cent. Reconsigned.

April 27.—T. A. Theron, Ceres Road, 50 packages, Codling moth, 1·5 per cent. Reconsigned.

April 20.—Western Fruit Supply, Worcester, 30 packages, Codling moth, 2 per cent. Reconsigned.

PEARS.

April 26.—Berger, Triangle, 26 packages, Codling moth, 1·5 per cent. Reconsigned.

April 19.—Pillay, Heidelburg, 10 packages, Codling moth, 2 per cent. Reconsigned.

April 20.—Pillay, Heidelburg, 14 packages, Codling moth, 10 per cent. Reconsigned.

QUINCES.

April 12.—H. M. Barber, Norvals Pont, 1 package, Codling moth, 3 per cent. Abandoned and destroyed.

April 19.—P. A. Black, De Doorns, 4 packages, Codling moth, 4 per cent. Reconsigned.

April 12.—K. Lala, De Doorns, 10 packages, Codling moth, 1·2 per cent. Reconsigned.

April 14.—K. Lala, De Doorns, 10 packages, Codling moth, 4 per cent. Reconsigned.

April 16.—K. Lala, De Doorns, 10 packages, Codling moth, 3 per cent. Reconsigned

April 20.—K. Lala, De Doorns, 20 packages, Codling moth, 2½ per cent. Reconsigned.

April 5.—V. Naidoo, De Doorns, 10 packages, Codling moth, 4 per cent. Reconsigned.

April 7.—V. Naidoo, De Doorns, 20 packages, Codling moth, 3 per cent. Reconsigned.

April 13.—V. Naidoo, De Doorns, 20 packages, Codling moth, 5 per cent. Reconsigned.

April 10.—K. M. Naidoo and Co., De Doorns, 10 packages, Codling moth, 3 per cent. Reconsigned.

April 5.—Pillay and Co., Heidelburg, 16 packages, Codling moth, 2½ per cent. Reconsigned.

*April 19.—Bathurst Farmers' Union, Grahamstown, oranges, 9 packages, red scale, 9 per cent. Reconsigned.

April 28.—Arenowitz Bros., King William's Town, potatoes, 9 packages, eelworm, 10 per cent. Reconsigned.

*April 23.—Arenowitz Bros., King William's Town, potatoes, 14 packages, eelworm, 20 per cent. Reconsigned.

April 27.—Fish and Co., Dordrecht, potatoes, 32 packages, eelworm, 22 per cent. Reconsigned.

*Condemned elsewhere than at Johannesburg.

TABULATED SUMMARY OF CAPE PRODUCE REJECTED BY THE TRANSVAAL ON ACCOUNT OF THE ACCOMPANYING PESTS.

Article.	Disease.	Extent to which infected by Sample examined.										Destroyed.		Re-consigned.		Total Rejected.	
		1 %		1 % to 2 %		2 % to 5 %		5 % to 10 %		Above 10 %							
		Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.
March, 1909.																	
Peaches ...	**Codling Moth**	...	...	4	173	2	79	3	46	3	13	5	97	7	214	12	311
	Fruit Fly	...	...	...	...	1	21	1	2	4	57	4	39	1	21	5	60
Pears	**Codling Moth**	...	...	2	46	7	170	3	29	8	35	12	56	8	224	20	280
Apples	**Codling Moth**	...	...	9	148	31	506	4	46	7	54	5	6	46	749	51	755
Quinces... ...	**Codling Moth**	...	...	1	23	1	1	1	1	...	...	1	1	2	24	3	25
Potatoes ...	**Nectria Solani** ...	...	...	...	...	1	13	...	...	...	...	...	...	1	13	1	13
	Bacterial Disease (Bacillus Solanaceavum)	...	...	...	...	...	...	...	...	1	23	...	...	1	23	1	23
Nectarines ...	**Fruit Fly**	...	...	...	...	...	...	...	...	1	3	1	3	...	...	1	3
Grapes	**Rotten**	...	...	...	...	...	...	...	...	2	2	2	2	...	...	2	2
Totals for	**March**	...	...	16	390	43	780	12	124	26	187	31	204	66	1.268	97	1,472
April, 1909.																	
Pears	**Codling Moth**	...	...	1	26	1	10	...	...	1	14	...	...	3	50	3	50
Apples	**Codling Moth**	...	...	6	117	6	186	1	4	1	6	2	10	12	303	14	313
Quinces... ...	**Codling Moth**	...	...	1	10	10	101	1	20	...	...	1	1	11	130	12	131
Potatoes ...	**Eelworm**	...	...	...	...	...	...	...	...	3	55	...	...	3	55	3	55
Oranges ...	**Red Scale**	...	...	...	...	...	...	1	9	...	...	...	...	1	9	1	9
Totals for	April	...	...	8	153	17	297	3	33	5	75	3	11	30	547	33	558

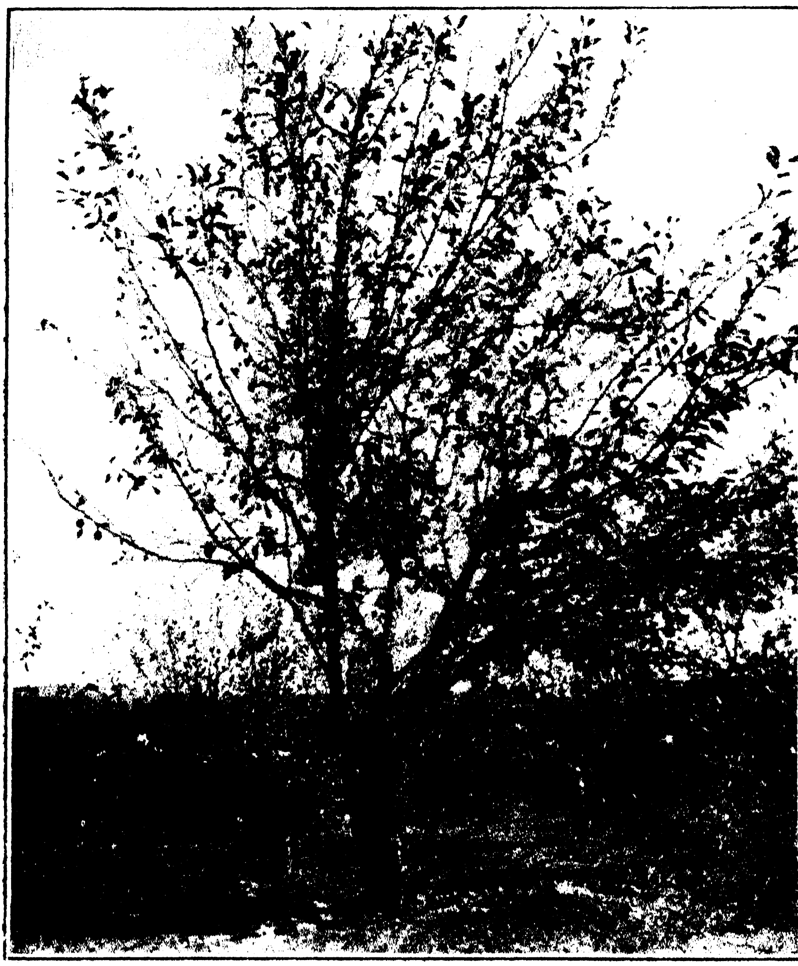
PRUNE RUST.

A LEAF DISEASE OF PRUNE, PEACH, AND APRICOT TREES.

SELF-BOILED LIME-SULPHUR WASH FOR SUMMER USE.

By CHAS. P. LOUNSBURY, Government Entomologist.

Prune Rust is discussed at this time because of a destructive outbreak of it on apricot trees at Wellington during the past fruit season. Unless the trees that then suffered are effectively sprayed during the approaching spring, they are likely to suffer severely again.



PRUNE RUST.—Prune tree almost defoliated by Prune Rust. Fruit not yet ripe. Wellington, February 20th, 1909.

Distribution, and Trees Attacked.

The disease is not a new one in the Colony. The writer observed that it was quite common in the Western Province when he came to the country in 1895, and he is quite sure that it is present in every part of the country he has visited since. Ordinarily in this Colony it has been of little economic importance excepting in the case of prune trees in some districts, as Paarl and Stellenbosch. Its chief host seems to be the peach tree, on which it is to be found to a slight extent in practically every peach orchard throughout the summer. The nectarine and plum (not Japanese) are also attacked, and likewise, according to reliable authorities, the cherry and almond. As with most fungous diseases some varie-

Prune Rust.—Peach and Apricot leaves showing spots on upper surface.

ties are attacked much worse than others. The writer had seen what he took to be this trouble on apricot trees in the Eastern Province two or three years ago, but that was very late in the season when an attack of this character is of little consequence, and he could hardly credit that he had to deal with the same fungus when he was called to inspect some very badly diseased apricot orchards at Wellington in late December. Mr. I. B. Pole Evans, the Transvaal Plant Pathologist, however, very kindly examined specimens and reported that the fungus present was none other than the common *Puccinia pruni*, or that of Prune Rust. The early varieties known as Alpha and Old Cape were by far the most affected.

Effect on Foliage.

The superficial appearances vary slightly with the kind of tree, but in all cases a brownish or reddish "rust" appears in small patches on the underside of the leaves. Under such patches, and showing strongly on the upper surface, peach leaves turn yellow in well-defined, irregular spots. Many scores of such spots may occur on a single leaf. The thicker leaves of the prune do not usually show the disease in pronounced spots on the upper surface, but the rust beneath seems more abundant and darker than in the case of the peach or apricot. The upper surface of the leaves of the apricot become speckled with yellow, but the spots are rounder and not so well defined as those on the peach. Much affected foliage loses colour throughout and falls prematurely. It is not uncommon for prune trees to become almost defoliated through this cause before the fruit drops, and many apricot trees at Wellington this last season became practically leafless early in January. The premature loss of peach foliage to a serious extent was reported a few years ago by farmers at Ceres and De Doorns, but ordinarily the disease does not cause the dropping of peach foliage early enough to do much injury to the trees at any place the writer knows of in Cape Colony.

Effect on Wood.

The young wood of the diseased apricot trees at Wellington was somewhat affected, and it is probable that the twigs of other trees also suffer. Dr. N. B. Pierce, in writing of the disease in a U.S. Government publication (Bull. 20, Div. Veg. Phys. and Path.), stated:—

> "It is a fact which does not appear to be generally known that Prune Rust infests the tender branches of the peach as well as its leaves. This has been found especially true in young trees. Spore clusters are found upon the young shoots before growth begins in the spring, showing that the disease winters over by means of spores produced upon and remaining attached to the branches, as well as by the spores produced upon the leaves and scattered over the tree."

The injury to the foliage and young wood has a lasting effect on the tree. Defoliated trees are unable to properly mature the fruit they carry at the time, and they may almost fail to fruit in the following year. Then they are very liable to throw out new growth which will perish in the winter, and to blossom wholly out of season, and their bark is apt to be severely burned by exposure to the summer sun.

Effect on Fruit.

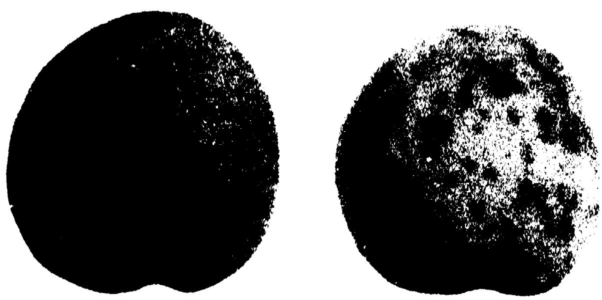
The damage which appeals most to the farmers is that to the fruit developing on the trees. The crop on many of the affected apricot trees at Wellington was quite ruined. The disease attacked it as well as the leaves and twigs, and so spotted and scabbed it that it was useless for the fresh fruit market or for drying or canning. On many trees it was difficult to find a fruit less spotted than the one shown on the right in the accompanying illustrations, while the whole of one side of many was made discoloured, hard, and very rough. Much of the fruit toughened and fell from the trees when little more than half grown.

The Plant Pathologist of Victoria, Australia, records a case of apricot fruit being attacked in South Australia, and states (in *Fungus Diseases of Stone-Fruit Trees in Australia*, 1902) that in two consecutive years he received Lady Palmerston peaches which were badly disfigured with the disease; they bore dark depressed spots with minute patches of rust, and some specimens were misshapen and cracked.

Remedies.

The writer is unable to find any record of experimental work undertaken to demonstrate the number and time of sprayings required to get the most satisfactory results in controlling Prune Rust; and all the published recommendations of treatments seem based largely on theory. There is no doubt, however, that thorough spraying with Bordeaux mixture is very effective in preventing the disease, and that lime-sulphur wash is excellent if applied shortly before the leaf buds open. Messrs. Picktone and Arton, of Groot Drakenstein, have sprayed their prunes to check the disease for about ten years. In response to a recent inquiry, Mr. Arton wrote:—

"For the last two or three years we have had very little rust, and attribute it almost entirely to our practice of spraying with Bordeaux mixture. We get our first spraying in as soon as the buds are fairly burst, and the second about three weeks later. I may mention that last winter we washed with lime-sulphur-salt, and that we were practically free from rust this summer."



Prune Rust.—Affected Apricots. One at left is much the worse scabbed. Wellington January 2nd, 1909.

Last winter Mr. P. J. Cillie, of Vruchtbaar, Wellington, chanced to spray some of his trees with lime-sulphur mixture to kill moss and lichens on the bark, and the freedom of the treated trees from rust compared with untreated ones of the same kind in the orchard was pronounced during the summer. The attack of the disease at this farm was rather light, but the good effects of spraying have led Mr. Cillie to decide to spray all his trees thoroughly during the present winter. The treatment will kill the moss and lichens, and is expected to be worth its expense on the varieties like Royal and Retief's Early, which were here practically free of rust, as a safeguard against shot hole fungus.

The most valuable spraying is almost doubtless one applied early in the spring before the leaf buds open. A spraying with Bordeaux mixture at this time will go far towards preventing Peach Leaf Curl; and if lime-sulphur instead is used, it will also check Bryobia Mite and White Peach Scale. Dr. N. B. Pierce, the American authority above quoted, continues in his remarks to state:—

"Where the trees are suffering from Rust it is therefore apparent that a thorough winter treatment is required to clean the tree and prevent the spring infection, hence such spraying is recommended for the control of both Curl and Rust, though the full control of the latter disease is very difficult and will, at best, be necessarily followed by several summer treatments. There can be little doubt, however, that a thorough winter spraying will prevent a greater portion of the injury from Rust than any single spraying applied at a later date, as it gives a practically clean tree at the opening of the season of growth."

Full directions for preparing Bordeaux mixture and lime-sulphur wash are given in English and Dutch in the revised edition of the sheet entitled "*Remedies for Orchard and Vineyard Pests*," recently published by the Department of Agriculture; a copy will be sent gratis by the Government Entomologist to any applicant.

Unfortunately the stone-fruit trees are susceptible to injury by Bordeaux mixture and lime-sulphur if sprayed during the growing season, especially in localities where misty rains are prevalent at that time, as in the south-eastern part of the Colony. So grave is the danger that the writer considers it is not advisable to make extensive use of these preparations on peach and apricot trees after the fruit sets other than in localities where years of experience have shown that the procedure is safe. The application of Bordeaux mixture is known to have caused serious scabbing of apricots in several eastern orchards last year. In the south-western districts the risk of injuring the fruit is much less, and experience seems to show that prunes, at least, may be treated repeatedly during the summer without causing any damage.

As a summer substitute for Bordeaux mixture in the case of peach and other trees which this fungicide is apt to injure, officers of the United States Bureau of Plant Industry have been experimenting with *self-boiled* lime-sulphur for the last two seasons. The results have been very satisfactory, leaf and fruit diseases being held in check while the trees were not injured. The only objection to the treatment was the slight whitish stain left on the fruit. South African farmers have long used dry mixtures of lime and sulphur for fungoid diseases of the grape, and boiled lime-sulphur wash for fruit trees, so the general adoption of a self-boiled mixture of lime and sulphur to replace Bordeaux mixture for the summer should not be difficult. Circular 27 of the U.S. Bureau of Plant Industry, dated April 21, 1909, says:—

> "The mixture that appeared to be most satisfactory in our experiments was composed of 10 pounds of lime and 10 pounds of sulphur to 50 gallons. . . . . The mixture can best be prepared in rather large quantities—say 20 pounds, or even 40 pounds, at a time—so as to get enough heat to produce a violent boiling for a few minutes. Place the lime in a barrel and pour on enough water (about 3 gallons to 20 pounds) to start it slaking and to keep the sulphur off the bottom of the barrel. Then add the sulphur, which should first be worked through a sieve to break up the lumps, and finally enough water to slake the lime into a paste. Considerable stirring is necessary to prevent caking on the bottom. After the violent boiling which accompanies the slaking of the lime is over, the mixture should be diluted ready for spraying, or at least enough cold water added to stop the cooking. Five to fifteen minutes are required for the process, according to whether the lime is quick acting or sluggish. . . . . Only a small percentage of the sulphur . . . . goes into solution. . . . . The mixture should be strained through a sieve of 20 meshes to the inch in order to remove the coarse particles of lime, but all the sulphur should be worked through the strainer. . . . . If desired, the mixture may be kept for a week or more without deterioration, but should be thoroughly stirred before using. . . . The mixture settles to the bottom of the tank, and unless kept thoroughly agitated cannot be evenly applied. . . . . The agitator of the ordinary barrel sprayer is not usually adequate, and when used should be supplemented with frequent hand agitation."

The American gallon is smaller than the gallon used in the Colony, and by our measures the quantities for making the smallest amount which it is suggested can easily be made at once are:—

Good quality unslaked lime	20 pounds.
Sulphur	20 pounds.
Water	80 gallons.

The mixing had best be done in a wooden barrel, and if an ordinary 45 gallon barrel is used, the dilution had best be to 40 gallons, thus making double strength wash which can be diluted to the proper degree by mixing it measure for measure with water in the spray tank. This spray mixture, in the light of the careful American experimental experience with it, is likely to prove valuable in the Colony not only as a summer spray for the prevention of Prune Rust, but also for the prevention of other fruit diseases, such as the common apricot spot disease of the Eastern Province and Fusicladium of the apple—for both of which it proved a specific in the American tests.

Two or three sprayings after the buds burst, say one late in September and another in November, or one each in September, October and November, would probably suffice to keep Prune Rust thoroughly under control if they were preceded by a treatment shortly before growth started in the spring. The spraying should be well done, and unless he has only a few trees no farmer should try to do the work with a spraying apparatus less powerful than a strong, heavy, barrel pump. If he feels that he cannot afford a proper pump for himself alone, he should arrange to buy one with a neighbour or get the use of one in some other way.

SUMMARY.

Prune Rust may give considerable trouble in the coming summer. Alpha and Old Cape apricots at Wellington are specially liable to severe injury. The disease attacks the common prune, certain plums, certain apricots and most peaches, and also some nectarines, almonds and cherries. The leaves spot and show "rust" on the under side, and the fruit may scab badly.

The trees at Wellington and elsewhere that suffered last season should be thoroughly sprayed with Bordeaux mixture or strong lime-sulphur wash before the growth starts. Other stone-fruit trees had best be given a precautionary treatment at the same time.

Subsequent treatments during the season of growth may be necessary to keep down the disease. Two or three applications of self-boiled lime-sulphur are suggested.

Those who propose to rely on the early spring spraying only are recommended to keep a very close watch on the trees most liable to the trouble, and to spray without a day's avoidable delay if the characteristic spots begin to show on the leaves or fruit. Unprofitable trees should not be allowed to breed the disease.

Use a strong, heavy barrel-pump, or a more powerful apparatus, and spray very thoroughly. Write to the Government Entomologist, Department of Agriculture, Cape Town, for a "Remedies Sheet" if you do not know how to prepare the spraying mixtures.

POTATO REJECTIONS BY THE TRANSVAAL.

EEL-WORM AND ROTS.

Owing to private information that the Transvaal authorities were rejecting Cape-grown potatoes, forwarded to Johannesburg and other Transvaal points, on account of troubles other than Potato Tuber Moth and *Nectria solani*, already notified, the Under Secretary for Agriculture telegraphed to the Transvaal Director of Agriculture on June 25th as follows:—

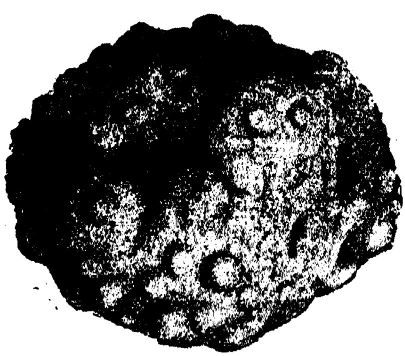
> "Rejections of potatoes for bacterial disease and nematode worm have come to my notice. Would be glad to learn for public notification what standards you have fixed for these and other potato troubles except Nectria and tuber worm which already known."

To this inquiry the following reply was received from the Transvaal Botanist on July 2nd:

> Your wire June 25th: Reject on any trace of bacteriological disease and on twenty per cent nematode. Sorting is allowed below twenty per cent.

Potato shippers should note the additional troubles. The *Nectria solani* already notified is not to be distinguished from the common Dry Rot of the Cape, and the Tuber Worm is what Cape farmers know as "miet," the small worm which tunnels through stored potatoes and whose excrement clings in little masses to the surface.

The common nematode worm of the potato is what is called Root Gall Worm in publications of this Department. In the Transvaal, it is called Eel-worm. It is a very common affection of the roots of many cultivated plants, causing the condition known as vrotpootje. The roots



ROOT GALL WORM IN POTATO.

swell and decay prematurely. The surface of infested potatoes generally becomes roughened and studded with small swellings, beneath which on cutting into the potato are seen water-white or discoloured spots, smaller than the head of a pin. Pear-shaped, pearly bodies, may often be found embedded in the spots; they are mature or nearly mature female worms.

The only bacterial disease for which a rejection has so far been reported is that due to *Bacillus solanacearum*. One lot of potatoes from Cathcart was sent back on account of it. It is not known whether or not

the trouble is often seen in this country. The only authentic record of its presence known to this Department is that conveyed by the rejection mentioned, and by a statement in the 1907—1908 Report of the Transvaal Department of Agriculture that it had been received from several farmers in the Johannesburg district. The disease attacks tomatoes and egg plants as well as potatoes, and is believed to be spread by infected seed tubers and by insects. The foliage is said to wilt and die suddenly, and the tubers to discolour in a ring a short distance from the surface and then to decay with a brown or black rot. The discoloured ring swarms with bacteria. A tuber showing a discoloured ring is figured in the article on Dry Rot elsewhere in this issue, but the disease in that case, though similar in general appearence, was due to the Dry Rot fungus.

In the Transvaal telegram, no mention is made of *Phytophthora infestans*, on account of which it has since been learned that several rejections took place in May. The name given is that of the fungus which causes real Potato Blight, otherwise known as Late Blight, Irish Potato Pisease, and Potato Murrain. The disease was not uncommon in eastern districts this year. A long spell of warm, wet weather greatly favours it and generally precedes outbreak. The tops of whole fields blight down suddenly, and the tubers are apt to break down rapidly with a wet rot if not kept cool and dry. A few tubers rot in the soil.

It is probable that the Transvaal authorities will reject consignments on account of still other troubles, and shippers are again recommended to send only clean, sound, healthy potatoes. Any lots which it is proposed to break down, it would be better to market the lot in the Colony. There is a risk in sending to the Transvaal any lot from which all decayed, cut, bruised, insect-injured, or otherwise blemished tubers have not been removed within a few days of shipment.

C. P. L.

FRUIT EXPORT.

Return of Fruit Shipped from Cape Colony during May, 1909.

Port of Shipment.	Destination.	No. of Packages.	Description of Fruit.	Quantities.	Value. £ s. d.
Cape Town ...	England	16	Pomegranates	320	8 0 0
" ...	"	450	Oranges ...	1,500	20 0 0
" ...	"	4	Apples ...	250	1 7 6
" ...	German South West Africa	2	Quinces ...	50	0 5 0
" ...	"	14	Pineapples ...	255	2 19 0
" ...	"	27	Pears ...	3,960	24 5 0
" ...	"	14	Bananas ...	8,700	8 5 0
" ...	"	58	Oranges ...	10,190	20 15 4
" ...	"	207	Apples ...	31,290	88 9 0
Port Elizabeth	England	1,545	Pines ...	30,532	111 5 0
" ...	"	1,916	Oranges ...	77,216	226 0 0

CORRESPONDENCE.

"South African Farmer's Bookkeeping."

To the Editor, Agricultural Journal.

Sir,—Owing to your kind notice of the above publication, I have been inundated with enquiries, and my Publishers inform me that a large number of the present edition is already in the hands of the public. I am now at work on an improved edition and should be glad to receive any criticisms or suggestions. Further, should any farmer who has purchased the volume have experienced difficulty in opening his accounts I shall be glad to assist him if he will communicate with me and explain his trouble.—Yours, etc.,

W. G. Dowsley.

St. Andrew's, Grahamstown.

Keeping Bees.

To the Editor, Agricultural Journal.

Sir,—In reply to Mr. J. E. Titterton's queries on the above subject appearing in June issue of the *Agricultural Journal*.

No. 1. Although swarms are frequently treated as detailed by your correspondent and hived on the old stand, this is done with the specific object of reducing the number of bees in the old colony to a minimum, with the idea of preventing an after swarm or cast; but it is quite an unnatural proceeding. If your correspondent is right in his surmise he should, after securing a swarm, place it on a new stand some distance from the old stock, cutting out queen cells, if not requiring a cast; as recommended in the articles on South African beekeeping recently appearing in the *Agricultural Journal*.

No. 2. This is the experience of bee-keepers generally, owing to the fact, that the flow of nectar has been temporarily suspended or that the nectar has been washed out of the flowers by the recent rain.

No. 3. Of course not knowing all the circumstances it is difficult to offer more than a conjecture. Your correspondent states that his hive had "the brood nest full of sealed honey and doing nothing in the surplus box." Unless the colony was queenless this points to bad management on the part of the owner. The brood nest of any hive should never be permitted to get choked with honey, sufficient space always being allowed for the queen to deposit eggs. If the colony was queenless this would partially explain the irritability of the bees.

I think it is a very doubtful procedure to sprinkle bees with syrup in the circumstances mentioned by your correspondent. On the other hand in manipulating a colony *without* honey; sprinkling with syrup is quite another matter, and can be applied beneficially.

Your correspondent is correct as to the right time for manipulating a colony being during the honey flow. But even so, the surplus honey has to be removed at the close of the season.

I would advise J. E. T. to induce his bees to store surplus honey in supers by methods explained in most guide books, and the removal of honey later on can be simplified by the use of a proper bee-escape board. *Vide* page 72, "South African Beekeeping."—Yours, etc.,

H. L. Attridge.

Mealie Culture.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In 1906 my son planted White Hickory King and German Yellow mealies side by side in rows, with the result that both were pollinated for about six rows on either side, the Hickory King being a pale yellow with occasional perfectly yellow grains, the German yellow being a pale yellow with occasional white grains.

About the end of October last, as an experiment, I selected seed from a Hickory King cob of above and planted twenty rows with from twenty to thirty seeds in each row, rows three feet apart. On the one side I planted two rows of eight row white mealie seed, this from seed I have grown for the last eight years. The ground had previously been well manured, watered and deeply dug. The whole of the seed came up, and when about four inches high was watered, after which there was no irrigation, but we had fair amount of rain.

The Hickory King grew to a height of from eight to ten feet, the eight row from five to six feet. With but few exceptions the Hickory King threw up from two to four stools from each seed, and there were not more than ten single stalks. Some of the stools bore two cobs each. The cobs on some of them I could only just reach. Where single stalks only the most had two cobs each.

On the side furthest from the eight row mealies, the majority of plants had from three to four stools each, nearer the eight row from two to three stools apiece, and the plants next to the eight row single stalks and two stools.

On one of the plants with four stools I found eight large cobs, on another wih four stools six large cobs, but did not count the grains carefully. The rest of the plants with four stools had from four to five cobs, from one of which I gathered the cobs and counted the grains.

1st Plant, four stools, five cobs, as follows:—3 cobs 16 rows each, 45 perfect grains in each row. 1 cob 16 rows, 40 perfect grains in each row. 1 cob irregular rows containing 377 perfect grains. Total 3,177 perfect grains from one sown.

2nd plant, three stools, four cobs, as follows:—1 cob 14 rows with 54 perfect grains in each row. 1 cob 14 rows 47 perfect grains in each row. 1 cob 14 rows 32 perfect grains in each row. 1 cob irregular rows, with 208 perfect grains. Total, 2,070 perfect grains from one.

3rd plant, three stools, three cobs, this plant was next row to eight row white, as follows:—1 cob 10 rows, 55 perfect grains in each row. 1 cob 12 rows, 43 perfect grains in each row. 1 cob 12 rows, 36 perfect grains in each row. Total, 1,498 grains from one seed.

From three plants with single stalks, and the only plants I found with one cob only, I gathered, counted, and weighed. 1 cob 16 rows, 43 perfect grains each row. Total, 688 grains, weight 20 ozs. 1 cob 16 rows, 43 perfect grains in each row. Total, 688 grains, weight 22 ozs. 1 cob 16 rows, 47 perfect grains each row. Total, 752 grains, weight 24 ozs.

These three cobs had been gathered, stripped and hung, exposed to wind and sun for over two weeks, before weighing. In counting the grains I did not count the small grains immediately around point of cob.

With respect to the eight row mealies I found the majority of cobs had ten and twelve rows each. The cobs and grain much larger. Further the Hickory King close to the eight row have grown back to original colour, white, whereas the rows further off still retain the yellow taint.—Yours, etc.,

J. J. KELLY.

Lady Frere, June 3.

Does Lucerne pay in the Midlands?

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In the May *Journal* an article appears on the extensive irrigation works at Tafelberg by Mr. Struben.

Being a novice on lucerne growing I would like to know whether it requires a dam 600 acre feet of water and a bore hole yielding 2,000,000 gallons per diem to irrigate only 200 acres of lucerne. It would appear that the pressure must be very great for 2,000,000 gallons to pass through a 6-inch pipe in 24 hours. If so the scheme would approximately (including dam) yield about 3,000,000 gallons per diem, capable of irrigating only 200 acres.

If this is the case poor chance for the general farming public according to my simple knowledge.

Would like the practical opinion of other farmers.—Yours, etc.,

NOVICE.

Maraisburg, June 3, 1909.

Sheep and Wool.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—When one reads in your *Journal* that in the "Alfred Beit" Cup competition wool produced by our leading sheep-breeders lost from 65 to 75 per cent. in scouring what remarks are we of the rising generation entitled to?

Veterans and "sheep-lords" answer please.—Yours, etc.,

FRED. S. WATERMEYER.

Richmond, C.C., June 8.

Ostrich Camps.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In reply to your request whether it answers to camp off a piece of the natural veld with lucerne as a run for ostriches. I must state that I believe very strongly in doing it myself, as it is decidedly just what the bird wants. Care should, however, be taken not to give the birds a chance during the last month when in full plumage to get at the water, as it is really just the last month that feathers are inclined to get damaged. If your veld is red karoo soil you should also keep them off just after the rain, as the feathers get very dirty through their sitting at night on the wet ground. Hoping this may prove useful advice.—Yours, etc.,

J. S. DE WET.

Zand Vliet, Ashton, June 25.

Scab and its Eradication.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In this month's number of the *Agricultural Journal* I saw a letter by Mr. J. S. Conroy re scab and curing thereof. Mr. C. is on the right track. I am glad to see he would like to cure his flocks of that pest, so will write for his information. To eradicate scab you must clean your farm. Scab on sheep or goats is easy enough to get rid of by dipping your stock in proper strength with one of the recognised dips. I used (Cooper's) twice in 14 days, and put them on a clean spot to sleep. Now comes the rub that the farmers do not like, that is to clean the farm. There is really only one way of doing it, and that is *fire* and *fire* only. Burn all the kraals and lay places at out stations and scab will be a thing of the past. It is going on for 21 years that scab was seen here last. I think that is proof enough that it can be eradicated. Our law is too weak. I am too proud to admit that the Australian farmers are better men than we are. If I could not cure scab in the Colony in one year I would hang myself. I know some farmers will jump down my throat when they read this letter; but then. What I would do is this. I would have a fixed penalty, viz., give a *scabby man* 3 months' notice to have his flocks and farm clean, and if he has not done so, fine him £25, then give him another three months', and if he has not followed instructions fine him £50. The fine must not be optional but a fixed penalty. That man would not risk another £50 nor would his neighbours. It would spread like wild fire right through the length and breadth of the land. The argument of the farmers that live in woodless parts of the Colony is that they can't burn their mist as they want it for fuel. I have told them over and over again to dig it out and stack it close to the house, then burn the crumbs. After that when the farm is clean they

can go on as usual. What a lot of the farmers do now is to buy stock at sales which are clean to the eyes, and mix them with their own clean stock without dipping first. The result is scab.—Yours, etc.,

W. E. MURRAY.

Roodebloem, Graaff-Reinet, June 24.

Lucerne and Water.

To the Editor, AGRICULTURAL JOURNAL.

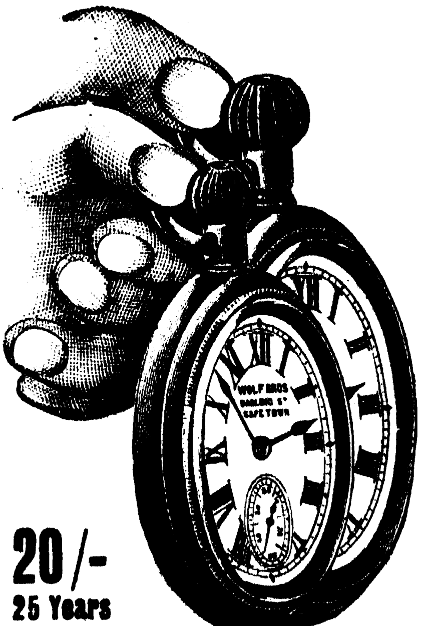
SIR,—Can you or any of your readers kindly inform me whether lucerne will grow and thrive on land flooded 3 or 4 times in winter to the height of about 4 feet, the water remaining on it for about 24 hours before it recedes. The ground in the driest part of the year (February) is so moist that water has been obtained at a depth of 8 feet, this being 1 foot below the level of the river bed.

I shall be glad to be informed also whether lucerne would grow or thrive on ground below a foot of which is potclay.—Yours, etc.,

A. DANEELS.

Wellington, June 20.

One of the essentials for successful lucerne cultivation is good drainage. It is, therefore, exceedingly unlikely that this crop could be grown with advantage in soil subject to the conditions mentioned above. It might possibly thrive for a short time, but so soon as the roots reached the water level the plants would die. As the Americans put it, "The one thing Alfalfa (lucerne) can't stand, is wet feet."



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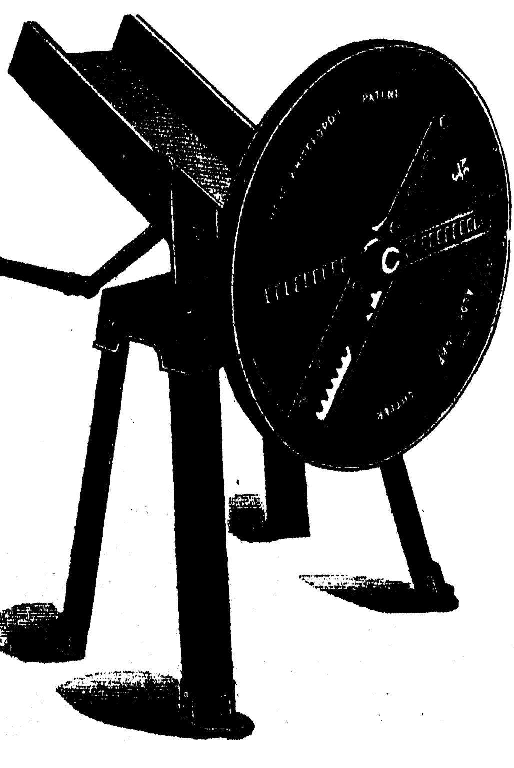

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NOTES ON THE WEATHER OF MAY, 1909.

By CHARLES M. STEWART, B.Sc., Secretary to the Meteorological Commission.

A mean barometric pressure slightly lower than the normal a mean temperature slightly less than usual, exceptionally mild days during the first half of the month, but with cold nights, and occasional severe frosts particularly during the last week, an unusually high percentage of cloud, with strong westerly winds, and a mean rainfall considerably above the average, except in the West and South-West, were the leading features of the weather of May, 1909.

DIVISION.	Mean Rainfall (1909).	Mean No. of Days.	Average Rainfall (1891-1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	3·10	6	4·80	9	—1·70	— 35
South-West ...	2·42	4	2·90	7	—0·48	— 17
West Coast ...	1·35	4	1·51	5	—0·16	— 11
South Coast ...	0·86	6	2·36	6	—1·50	— 64
Southern Karoo ...	0·64	3	0·99	4	0·35	— 35
West Central Karoo ...	1·33	6	0·85	3	+0·48	+ 56
East Central Karoo ...	2·18	6	0·79	3	+1·39	+176
Northern Karoo ...	1·78	6	0·85	3	+0·93	+109
Northern Border ...	2·02	5	0·62	3	+1·40	+226
South-East ...	2·49	7	1·35	5	+1·14	+ 84
North-East ...	2·59	8	1·02	4	+1·57	+154
Kaffraria ...	4·15	8	1·10	4	+3·05	+277
Basutoland ...	3·31	10	1·38	4	+1·93	+133
Orange River Colony...	...	...	1·04	3	...	...
Durban (Natal) ...	5·82	9	1·79	...	+4·03	+225
Bechuanaland ...	1·40	5	0·50	1	+0·90	+180
Rhodesia ...	0·11	2	0·45	1	—0·34	— 76

Precipitation.—The rainfall during May, on the mean of 364 stations, amounted to 2·28 ins. on 6 days, being 0·47 in. or 26 per cent. above the normal. This amount is 0·19 in. more than last month, and 1·57 in. above (or more than three times) the mean for May, 1908. A glance at the accompanying table will show that there were large deficiencies in the extreme south and west, as well as in Rhodesia, more particularly over the Cape Peninsula and the South Coast, the percentage deficit ranging from 76 per cent. in Rhodesia to 11 per cent. along the West Coast. All over the rest of the country there was a large surplus of precipitation, varying between an excess of 3·05 ins. (or 277 per cent.) in Kaffraria, and 0·48 in. (or 56 per cent.) over the West Central Karoo. Compared with the corresponding month of last year the mean precipitation was much heavier over all sections of the country, except the South Coast and the Southern Karoo, where it was slightly less. The increase varied in amount from 0·05 in. in Rhodesia to 5·45 ins. at Durban (Natal), but was mostly from 1 to 2 inches. Contrasted with the preceding month (*i.e.*, April last), the rainfall was heavier over the West and South-West areas,—including the Cape Peninsula,—the East Central Karoo, Kaffraria, Basutoland, Bechuanaland and at Durban (Natal) by amounts ranging from 0·02 in. in Basutoland to 3·55 ins. at Durban. Over the remainder of the divisions there was a falling off in the amounts recorded, the decrease lying between 0·14 in. over the North-East to 1·20 in. at the South Coast Stations. An examination of the totals recorded at the individual stations shows that no station suffered from absolute drought during the month; 21 had 0·01—0·50 in.; 33 had 0·51—1·00 in.; 123 had 1·01—2 ins.; 106 had 2·01—3 ins.; 50 had 3·01—4 ins.; 17 had 4·01—5 ins.; 5 each had 5·01—6 ins. and 6·01—7 ins., leaving four (4) of the 364 stations with over 7 ins., viz., Chiselhurst, 7·60 ins.; Cwebe, 7·89 ins.; East London East, 8·75 ins., and Port St. John's with the very large total of 22·85 ins. Of 356 stations furnishing details of the daily falls, 71 had 0·01—0·50 in.; 163 had 0·51—1·00 in.; 100 had 1·01—2 ins.; 11 had 2·01—3 ins.; 6 had 3·01—4 ins.; and four (4) had 4·01—5 ins., whilst Port St. John's had the extraordinary total of 15·04 ins. registered on the 10th, whilst on the previous day 7·34 ins. were recorded, making a total of 22·38 ins. in 48 hours. This fall, apparently purely local, flooded the country, causing

a great deal of damage. This is believed to be the heaviest fall in 24 hours that has been recorded in the Colony, the previous record amount being 10·37 ins. at Vogel Vlei (near Mossel Bay), in 14 hours on the 26th October, 1904. On the 11th to 12th June, 1902, 8·60 ins. fell at Port St. John's in 23 hours. *Thunderstorms* although much less frequent than during the preceding month were more than twice as numerous as during May, 1908, 177 instances being noted on 19 days, more particularly the 5th, 6th, and 20th to 22nd. *Hail* fell at 12 stations on 6 days, chiefly the 21st. *Snow* was reported as falling at MacGregor on the 23rd, and Lauriston on the 30th. *Sleet* was noted at five (5) stations on an equal number of days.

Temperature, Cloud, and Wind.—The mean monthly temperature of all stations was 57·5°, being 6·0° cooler than during April last, and 0·6° lower than May of the preceding year. The mean maximum temperature (68·3°) is 5·4° lower than last month, and 2·2° below that of the corresponding month of 1908, while the mean of the minimum temperature (46·8°) is 6·5° lower than the value for April last, but 0·9° higher than in May of 1908. The mean daily range (21·5°) is 1·1° greater than in the immediately preceding month, but 3·1° less than in the previous May. Compared with the normals, the mean monthly temperature is 0·4° lower, owing entirely to the day temperatures being 0·8° colder than usual, the mean of the night temperatures being the same as the average. The mean maximum temperature was slightly above the average at many stations at or near the Coast in the West and South, as well as at one or two stations inland, the excess ranging from 3·6° at Hanover to 0·0° at Amalienstein. At the majority of stations, however, the days were colder than usual by amounts varying from 4·5° at Bedford and Rietfontein, to 0·2° at Port Elizabeth. The nights were colder than usual by 1—2 degrees or more at most stations in the West and South-West, as well as at a few places in the central and eastern portions; the deficits decreased to a few tenths of a degree along the South Coast and in parts of the South-East, but were changed to a small excess at a fair proportion of the stations in these areas, the excess increasing to 1—4 degrees in the east and in the interior, reaching 4·9° at Kokstad, and 3·6° at Aliwal North. Generally speaking, the mean monthly temperature was mostly only a small fraction of a degree above or below the normal, except at one or two stations, notably Hopefountain, where there was a deficiency of 3·1°, Bedford with minus 2·4° and Kokstad with an excess of 2·2°. The mean warmest station was Port St. John's, with 64·5°, and the mean coolest, Rietfontein with 49·90°, a difference of 14·6°. The highest mean maximum of 73·8° belongs to Dunbrody, and the lowest mean minimum of 32·3° to Hanover. Warm periods occurred during the month between the 3rd and 6th, 12th and 16th, 20th and 22nd, and on 26th and 27th, but the highest temperatures were most numerously registered on the 4th. The coldest mornings were most commonly those of the last eight days (24th to 31st), notably the 29th, although the lowest readings of the thermometer occurred at a few stations on other 6 days, earlier in the month. The mean value of the highest temperatures was 81·9°, being 4·6° lower than in April, and 1·6° less than in the previous May. The mean of the coldest morning was 37·3° or 5·7° below the corresponding value in April, and 0·3° below that for the corresponding month of 1908. The mean monthly range was therefore 44·6°. The extreme values for the month were 90·0°, on the 4th at Robertson, on the 5th at Chiselhurst, and on the 13th at Port Nolloth, and 21·0° at Murraysburg on the 27th, yielding an extreme monthly range of 69°. *Frost* which has been unusually late in the date of its first occurrence at many stations, was noted on 23 days, there being 118 instances of the occurrence of this phenomenon during the month. It was reported from a fairly large number of stations on the first four days of the month, less commonly from 10th to 13th, and 16th to 21st and 23rd, but over a large area from the 24th to the end of the month, particularly the 31st The mean amount of *Cloud* was 47 per cent. the same as last month, but 13 per cent. less than in May, 1908. It was fairly uniform over the country, ranging from 55 per cent. over the Cape Peninsula to 34 per cent. in Rhodesia, being mostly about 45 per cent. over the Cape Colony. It varied between 30 per cent. at Storm's River and 68 per cent. at Port St. John's. *Fog or Mist* was of fairly frequent occurrence, being reported as occurring on 120 occasions on 27 days, most widely on the 8th, 10th, and 11th. The only days on which no station noted its occurrence were 1st, 2nd, 3rd, and 14th. The prevalent morning *Wind Directions* were westerly (N.W. to S.W.) over the greater prat of the country, but Easterly (N.E. to S.E.) at Port Nolloth, along a small portion of the South Coast between George and Van Staaden's River, at Kimberley, Aliwal North and Hopefountain. Generally speaking the winds were much stronger than usual all over the country, their mean *Force* on the Beaufort Scale of (0—12) being 1·84 corresponding to a mean velocity of 12·2 miles per hour or 2·1 m. per hour more than in May, 1908, and 0·2 m. per hour more than the preceding month. The force was greatest, 2·58, over the Cape Peninsula, and least, 0·42 at Hopefountain. The records of the Royal Observatory show an excess of winds from S.S.W., S.W., W., N.N.W. and N., as well as an unusually large number of calms; but an entire absence of those from any direction between N.N.E. and S.E., as well as a decreased frequency of those from S., W.S.W., W.N.W. and N.W. The mean force there in the mornings was 1·16 corresponding to

a mean hourly velocity of 8·8 miles or 0·08m. per hour less than usual. *Gales* were reported as occurring at 38 stations on 10 days, principally the 23rd. *Hot Winds* were experienced on 5 occasions on an equal number of days, but no *Duststorms* seem to have occurred during the month.

The mean barometric pressure at the Royal Observatory (30·09 ins.) was 0·02 ins. lower tnan the normal.

OBSERVERS' NOTES.

VRUCHTBAAR.—First half of month exceptionally dry, so that all ploughing had to be stopped for a time. After the rains of the 15th and 23rd is just in the best position for all kinds of farm work. Citrus crops not so good this as last season: fruit, however, very fine.

ANENOUS.—Still numerous bad cases of Ophthalmia in district. Veld greatly improved since last month.

PLETTENBERG BAY.—The driest month since August, 1903. Rain very much needed, water for drinking and ordinary purposes required, ploughing not yet commenced.

UITENHAGE PARK.—A variable, but on the whole, seasonable month. Four hot winds. Frost first observed on 29th.

NEW BETHESDA.—River in flood since 8th February to 8th May—13 times. Fountains running strong everywhere.

THEEFONTEIN (Hanover).—Fog on 12th, 19th, and 30th. Frequent frosts; N.W. gale on 23rd. Weather very changeable towards end of month. Locusts about in parts of District.

VARKEN'S KOP (Middelburg).—During the month, strong winds have been prevalent and sharp frosts at latter part of month.

FORT BEAUFORT.—Large swarms of locusts in District, passing. Farmers complaining that all their winter grass is eaten off.

HUXLEY (Stutterheim).—The outlook for the winter is good, grass being quite green, crops of mealies heavy on some farms, live stock healthy.

CONTEST (Bothma).—First frost of season on 28th, scorched pumpkins, etc.

SUNNYMEADE (Albany).—Small stock are not doing so well as they should, owing to the continuous rains. Veld is very good. Crops seem quite healthy.

THIBET PARK (Queenstown).—Warm month; first frost on the 17th, very late.

KOKSTAD.—Winter up to the present has been mild. Good crops of mealies harvested this season.

TENT KOP (Maclear).—Ground moist and veld good for time of year. Stock in good condition—particularly small stock.

GROOT DRAKENSTEIN.—Mean temperature of month 0·2° below average, the nights being 2·9° colder, and days 2·6° warmer than usual. Rainfall 1·21 below average, or 76 per cent. of average. The weather continued dry till the 15th, when a good rain fell and ploughing became practicable.

MOUNT AYLIFF.—Reaping is going on everywhere, and good crops are being realised. The country as a whole has not been so well soaked for very many years.

PORT ST. JOHN'S.—The rainfall on the 10th (15·04 inches) was the heaviest ever known. Country flooded and great amount of damage done.

CARNARVON FARM.—This has been one of the best all round months we have had during the last ten years. It will be seen that only on one occasion has the rainfall been exceeded, viz., 1903, when we had 2·59 inch. It will therefore be seen that the present 2·13 in. is nearly double the average since 1901. Wind is below the average, also " no clouds, whilst frosts are somewhat above—though 8 out of the 14 frosts recorded were only visible away from Vleis. The rain which fell over 12 days, was all that could be wished for., Crops already in, and the prospects of a good season so far are bright. The veld has never been better, and seldom so good. Water plentiful everywhere, and all stock if not fat are in good condition. A few cases of gall sickness amongst cattle; also one hears of an odd horse dying here and there. No locusts in this district, and no fear of their appearing till the voetgangers down country take wing next summer.

Year.	Rain.	Winds.	No Clouds.	Frost.
1901	0·30	10	10	18
1902	0·20	9	3	8
1903	2·59	14	1	6
1904	0·24	8	6	18
1905	1·97	7	1	9
1906	1·51	7	5	10
1907	0·99	12	1	13
1908	0·91	5	1	10
1909	2·13	7	2	14
Averages	1·20	9	3	12

TEMPERATURE, MAY, 1909.

STATIONS.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	
Royal Observatory ...	69·2	49·8	59·5	87·5	3	41·4	29
Table Mountain (Disa Head)	60·8	47·2	54·0	75·0	3	37·0	24
„ „ (Devil's Peak)	64·6	49·0	56·8	83·0	3	41·0	24
Groot Constantia ...	66.4	50·4	58·4	81·0	12	41·0	21
Bishopscourt ...	66·5	47·7	57·1	85·0	3	40·0	30
Wynberg ...	67·2	48·7	58·0	84·8	4	42·0	21
Retreat ...	68·9	46·0	57·4	84·2	4 & 14	36·8	18
Danger Point ...	63·4	53·0	58·2	70·0	4 & 14	47·0	31
Robertson Plantation ...	73·1	41·5	57·3	90·0	4	29·0	1
Elsenberg (Agri. College) ...	69·6	48·3	59·0	87·4	3	41·9	28
Groot Drakenstein ...	71·4	44·8	58·1	87·6	3	35·3	29
O'okiep ...	69·9	46·2	58·0	83·1	4	34·0	30
Port Nolloth ...	68·7	47·6	58·2	90·0	13	41·5	22, 28 & 31
Port Elizabeth ...	69·7	53·7	61·7	85·0	4	46·0	29
George (Plantation) ...	69·1	49·1	59·1	84·0	4	41·0	29
Cape Agulhas ...	65·3	54·5	59·9	77·0	4	49·0	24 & 31
Storm's River ...	70·2	48·4	59·3	82·0	4	43·0	2, 25 & 26
Concordia (Plantation) ...	70·9	52·1	61·5	87·0	4	43·0	28
Heidelberg ...	71·0	46·0	58·5	87·0	4	33·0	29
Van Staaden's ...	69·2	50·6	59·9	86·0	6	40·0	29
Cape St. Francis ...	68·2	53·8	61·0	84·0	4	46·0	30
Dunbrody ...	73·8	46·5	60·1	89·1	5	33·6	29
Amalienstein ...	73·3	40·7	57·0	81·0	3, 4, 14 & 22	29·0	29
Hanover ...	68·6	32·3	50·4	81·0	1	24·0	29 & 30
Murraysburg ...	62·8	37·4	50·1	72·0	22	21·0	27
Kimberley ...	69·1	43·8	56·4	78·9	20	34·8	25
Hope Town ...	68·2	42·4	55·3	75·8	21	33.0	28
Stutterheim ...	67·0	47·2	57·1	80·0	5	35·7	29
Sydney's Hope ...	67·9	51·0	59·4	83·0	5	39·5	28
Bedford ...	67·1	45·5	56·3	81·0	6	33·0	29
EastLondon ...	70·6	53·5	62·0	89·0	16	47·0	29
Lovedale ...	68·9	45·9	57·4	83·0	5	33·0	29
Evelyn Valley ...	62·5	44·8	53·6	73·0	26	30·0	10
Chiselhurst ...	75.0	51·2	63·1	90·0	5	42·0	31
Aliwal North ...	65·8	39·9	52·8	75·5	4 & 5	27·5	31
Rietfontein (Aliwal N.) ...	59·8	40·0	49·9	71·0	3	31·5	31
Tabankulu ...	66·1	45·7	55·9	77·3	26	37·5	25
Main ...	65·4	46·4	55·9	77·5	5	34.2	29
Mount Ayliff ...	69·5	46·1	57·8	82·0	5	35·0	25
Umtata ...	70·2	46·3	58·2	84·0	5, 15 & 26	36·0	31
Port St. John's ...	72·8	56·2	64·5	84·0	6	47·0	28
Kokstad ...	64·9	40·3	52·6	76·0	27	31·0	25
Kuruman ...	69·2	41·0	55·1	78·0	21	32·0	24
Hope Fountain ...	72.7	47·1	59·9	79·0	27	43·0	21 & 22
Means ...	68·3	46·8	57·5	81·9		37·3	...
Extremes ...	...	...	...	90·0	4, 5 & 13	21·0	27

RAINFALL, MAY, 1909.

I. CAPE PENINSULA:

	INS.
Royal Observatory (*a*) 12in. gauge	1·92
Cape Town, Fire Station...	1·86
Do. Molteno Reservoir ...	2·38
Do. Platteklip ...	3·15
Do. Signal Hill ...	1·50
Sea Point, The Hall ...	2·10
Camp's Bay ...	1·76
Table Mountain, Disa Head ...	1·65
Do. Kasteel Poort...	4·05
Do. Waai Kopje ...	5·52
Do. St. Michael's ...	4·70
Devil's Peak, Blockhouse ...	3·21
Do. Nursery ...	2·67
Woodstock, The Hall ...	2·41
Do. Municipal Quarry ...	2·25
Do. do. Nipher's Shield	2·60
Newlands, Montebello ...	4·71
Bishopscourt ...	4·59
Kenilworth ...	3·92
Wynberg, St. Mary's ...	3·95
Groot Constantia ...	3·32
Tokai Plantation ...	4·57
Plumstead, Culmwood ...	3·38
Muizenberg (St. Res.) ...	3·90
Cape Point...	0·66
Robben Island ...	1·92
Maitland Cemetery ...	1·86
Tamboers Kloof ...	2·26
Woodhead Tunnel...	3·71
Lower Reservoir ...	2·40
Maclears Beacon ...	5·34
Waai Vlei ...	4·12
Woodhead Dam ...	3·73
Retreat ...	3·35

II. SOUTH-WEST:

Eerste River ...	2·16
Klapmuts ...	3·40
Stellenbosch, Gaol ...	2·58
Somerset West ...	3·41
Paarl ...	3·24
Wellington, Gaol ...	1·93
Groot Drakenstein, Weltevreden	3·88
Tulbagh ...	3·00
Ceres ...	6·39
Rawsonville ...	2·96
Caledon ...	1·52
Worcester, Gaol ...	1·48
Hex River ...	2·29
Karnmelks River ...	1·25
Lady Grey, Div. Robertson ...	0·70
Robertson, Gaol ...	0·94
Do. Govt. Plantation ...	0·79
De Hoop ...	1·00
Montagu ...	1·86
Danger Point ...	2·07
Elgin Plantation ...	4·82
Elsenberg Agricultural College...	3·38
Roskeen ...	2·34
Vruchtbaar ...	2·34

III. WEST COAST:

Anenous ...	0·63
Klipfontein ...	1·06

III. WEST COAST (*continued*):

	INS.
Kraaifontein ...	0·39
O'okiep ...	1·12
Springbokfontein ...	1·43
Concordia (Krapohl) ...	0·36
Garies ...	1·37
Lilyfontein... ...	2·33
Van Rhyn's Dorp ...	1·28
Clanwilliam, Gaol ...	1·23
Dassen Island ...	0·94
Kersefontein ...	1·48
The Towers ...	1·34
Malmesbury ...	1·52
Piquetberg ...	1·80
Wupperthal ...	1·71
Welbedacht ...	1·11
Hopefield ...	1·03
Algeria (Clanwilliam) ...	2·56
Cedarberg (do.) ...	3·31

IV. SOUTH COAST:

Cape Agulhas ...	1·22
Bredasdorp... ...	1·34
Swellendam ...	0·75
Potberg ...	0·53
Grootvaders Bosch	1·11
Heidelberg ...	0·36
Riversdale ...	0·17
Mossel Bay...	0·14
Great Brak River...	0·31
George ...	0·66
Do. (Plantation) ...	0·59
Woodifield (George) ...	1·20
Millwood ...	0·63
Sour Flats ...	0·40
Concordia ...	0·54
Knysna ...	0·36
Buffel's Nek ...	0·75
Plettenberg Bay ...	0·49
Harkerville ...	0·73
Blaauwkrantz ...	0·46
Lottering ...	0·49
Storms River ...	0·87
Witte Els Bosch ...	0·74
Humansdorp ...	0·98
Cape St. Francis ...	1·21
Van Staden's, Intake ...	1·18
Do. On Hill ...	1·20
Kruis River ...	1·39
Uitenhage (Gaol) ...	1·21
Do. (Park)... ...	1·33
Armadale (Blue Cliff) ...	2·49
Dunbrody ...	1·57
Port Elizabeth (Harbour) ...	0·59
Do. (Walmer Heights)	0·64
Centlivres ...	1·92

V. SOUTHERN KAROO:

Ladismith ...	0·15
Amalienstein ...	0·21
Vlakte Plaats ...	0·27
Uniondale ...	0·76
Kleinpoort... ...	1·82

VI. WEST-CENTRAL KAROO:

	Ins.
Prince Albert	0·33
Zwartberg Pass	0·90
Booi's Kraal (Beaufort West)	0·90
Beaufort West, Gaol	3·32
Dunedin	1·93
Nel's Poort	1·36
Camfers Kraal	1·16
Baaken's Rug	1·59
Willowmore	0·88
Rietfontein	1·28
Steytlerville	1·47
Lemoenfontein	2·42

VII. EAST-CENTRAL KAROO.

Buffels Kloof	2·90
Aberdeen, Gaol	3·21
Aberdeen Road	2·05
Kendrew, Holmes	3 23
Do.	1·73
Graaff-Reinet, Gaol	2·15
New Bethesda	1·45
Roodebloem	2·05
Glen Harry	1·34
Jansenville	1·56
Roode Hoogte	2·31
Toegedacht	2 05
Klipfontein	2·31
Pearston	2·38
Middlewater	1·81
Somerset East, Goal	2·61
Spitzkop (Graaff-Reinet)	2·20
Grobbelaar's Kraal	1·90
Zeekoe River (Aberdeen)	2·11

VIII. NORTHERN KAROO:

Middlepost	0·81
Sutherland	1·46
Fraserburg	1·37
Carnarvon	1·15
Victoria West	1·17
Wildebeestkooij	2·40
Murraysburg	3·02
De Kruis, Murraysburg	2·74
Richmond	1·78
Hanover	1·10
Theefontein	1·07
Philipstown	3.75
Petrusville	4·64
The Willows, Middelburg	1·46
Colesberg	2·17
Tafelberg Hall	1·12
Fish River	1·38
Varkens Kop	1·33
Culmstock	1·17
Droogefontein	1·60
Cradock (Gaol)	1·58
Witmoss	1·40
Maraisburg	2·71
Steynsburg (Gaol)	2·45
Tarkastad	1·95
Do. (District Engineer)	1·61
Drummond Park	2·16
Waverley	2·02
Montagu	2·37
Schuilhoek	1·13
Vosburg	1·01
Zwavelfontein	0·53
Hultfontein, Colesberg	2·09
Offermankraal (Middelburg)	2·47

VIII. NORTHERN KAROO (*con.*):

	Ins.
Elands Vlei (Calvinia)	0·25
Hartebeestefontein, Steynsburg	2·14
Willow Walk, Tarkastad	1·66
Hotweg Kloof, Cradock	1·20
Thebus Waters	2·10

IX. NORTHERN BORDER:

The Halt	2·01
Keimoes	0·83
Kenhardt	0·67
Upington	2·49
Trooilapspan	2·38
Van Wijk's Vlei	0·66
Prieska	1·25
New Year's Kraal	1·82
Dunmurry	2·17
Karree Kloof	2·21
Griquatown	2·41
Douglas	3·62
Hope Town	2·62
Orange River	2·51
Newlands, Barkly West	1·25
Barkly West	1·81
Kimberley Stephens	2·96
Strydenburg	2·12
Rietfontein, Gordonia	1·02
Douglas, Vos	3·76
Stoffkraal, Prieska	1·95
Mazelsfontein, Herbert	2·83
Rocklands, Barkly West	1·12

X. SOUTH EAST:

Dagga Boer	1·80
Fairholt	1·97
Lynedoch	1·23
Alicedale	0·47
Bedford (Gaol)	2·15
Do. (Hall)	1·84
Sydney's Hope	1·45
Adelaide	1·75
Atherstone	1·62
Alexandria	1·00
Fort Fordyce	2·08
Graham's Town (Gaol)	2·54
Heatherton Towers	1·03
Sunnyside	2·25
Fort Beaufort	2·13
Katberg	2·45
Seymour	1·25
Glencairn	1·58
Lovedale	1·73
Port Alfred	2·21
Hogsback	2·74
Peddie	2·71
Keiskamma Hoek	1·31
Cathcart (Gaol)	1·51
Do. (Forman)	1·82
Do.	1·56
Thaba N'doda	3·70
Evelyn Valley	5·42
Perie Forest	1·86
Isidenge	2·20
Kologha	2·39
King William's Town (Gaol)	1·84
Stutterheim, Bousfield	2·51
Fort Cunynghame	2·13
Dohne	2·34
Kubusie	1·77
Quacu	2·28

X. SOUTH EAST (*continued*):

	Ins.
Blaney	1·50
Kei Road	2·41
Berlin	4·65
Bolo	1·54
Fort Jackson	3·78
Prospect Farm, Komgha	3·85
Komgha (Gaol)	3·76
Chiselhurst	7·60
East London West	6·02
East London East	8·75
Cata	1·73
Wolf Ridge	2·84
Dontsah	2·14
Mount Coke	3·10
Albert Vale, near Bedford	1·35
Huxley Farm, Stutterheim	1·96
Amabele Junction	2·85
Izileni, King Wms. Town	2·42

XI. NORTH-EAST:

Venterstad	3·68
Mooifontein	3·36
Burghersdorp (Gaol)	2·88
Ellesmere	3·76
Molteno	2·62
Lyndene	3·23
Cyphergat	2·90
Thibet Park	1·33
Sterkstroom (Station)	2·10
Do. (Gaol)	1·79
Rocklands	1·91
Aliwal North (Gaol)	3.41
Do. (Dist. Engineer)	3·51
Carnarvon Farm	2·13
Haleston	2·04
Jamestown	3·01
Whittlesea	1·18
Queenstown (Gaol)	1·56
Do. (Dist. Engr.)	2·13
Rietfontein, Aliwal North	4·04
Middlecourt	2·49
Dordrecht	2·56
Tylden	0·84
Herschel	4·28
Lady Grey	3·66
Lauriston	2·52
Lady Frere	1·65
Sterkspruit	2·10
Keilands	1·61
Barkly East	1·58
Cliftonvale	2·07
Albert Junction	2·72
Hughenden	2·51
Glenwallace	2·79
Indwe (District Engineer's Office)	2·39
Bensonvale Inst., Herschel	3·73
Dordrecht (Dist. Engineer)	3·28
Lady Grey, Station	3·16
Indwe, Collieries	2·12
Stormberg Junction	3·80
Hopewell, Imvani	1·73
Sunny Meade, Div. Albert	1·89
Clifton, Sterkstroom	1·75
Carrickmore, Molteno	3·03

XII. KAFFRARIA:

	Ins.
Slaate, Xalanga	3·23
Cofimvaba	2·30
Tsomo	1·96
N'qamakwe	2·35
Main	1·80
Engcobo	3·88
Butterworth	3·62
Woodcliff	2·87
Kentani	4·45
Maclear	2·80
Idutywa	2·28
Bazeya	4·96
Willowvale	4·62
Mount Fletcher	3·54
Somerville, Tsolo	4·58
Elliotdale	4·95
Umtata	6·83
Cwebe	7·89
Tabankulu	6·47
Mount Ayliff	4·58
Kokstad	2·24
Do., The Willows	2·38
Flagstaff	5·73
Insikeni	3·07
Port St. John's	22·85
Umzimkulu	2·49
Wanstead	1·71
Maclear, Station	2·91
Tabankulu, Atkins	6·43
Umzimkulu, Strachan	2·70
Elliot	2·60
Tent Kop, Elands Height	2·93
Waterfall Farm, Kokstad	3·07
Elton Grange, Mount Currie	1·80
Ugie	2·25

XIII. BASUTOLAND:

Mafeteng	2·80
Maseru	2·86
Teyateyaneng, Berea	3·41
Moyeni Quthing	3·67
Qacha's Nek	3·80

XV. NATAL:

Durban, Observatory	5·82

XVII. BECHUANALAND:

Taungs	1·30
Setlagoli	1·16
Kuruman	1·41
Zwartlaagte	1·67
Nottinghame, Mafeking	1·18
Armadillo Creek, Vryburg	1·68

XVIII. RHODESIA:

Hopefountain	0·18
Rhodes Matoppo Park	0·04

CURRENT MARKET RATES (WHOLESALE) OF AGRICULTURAL PRODUCE.

The following Table of Current Market Rates (Wholesale) of Agricultural Produce on Saturday, the 26th June, 1909, ruling at the several centres named, is published for general information.

CENTRE.	A. Wheat per 100 lbs.	B. Wheat Flour per 100 lbs.	C. Boer Meal per 100 lbs.	D. Mealies per 100 lbs.	E. Mealie Meal per 100 lbs.	F. Barley per 100 lbs.	G. Oats per 100 lbs.	H. Oat-hay per 100 lbs.	J. Lucerne Hay. per 100 lbs.	K. Potatoes per 100 lbs.	L. Tobacco (Boer Roll) per lb.	M. Beef per lb.	N. Mutton per lb.	O. Fresh Butter per lb.	P. Eggs per doz.	Q. Cattle (Slaughter)	R. Sheep (Slaughter)
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d	£ s. d.	£ s. d.		
Aliwal North..	0 12 6	1 1 0	0 14 0	0 6 0	0 8 6	0 9 0	0 10 6	0 6 0	0 5 0	0 6 0	0 1 0	0 0 6	0 0 4	0 1 6	0 2 6	£10	14/-
Beaufort West	0 13 6	0 18 6	0 14 6	0 7 0	0 9 0	0 10 0	0 8 4	0 6 0	0 6 0	0 10 8	0 0 8	2d. to 3d	3d. to 4d.	0 1 6	0 2 0	£10	14/-
Burghersdorp	0 13 6	0 10 0	0 15 9	0 5 0	0 8 0	0 6 0	0 10 0	0 5 0	..	0 6 0	0 1 9	0 0 5	0 0 4	0 1 0	0 1 5	£8	12/6
Cape Town ..	..	..	..	..	..	0 7 0	0 5 6	0 4 0	0 5 3	0 10 8	..	..	..	0 1 3	0 1 7	..	..
Clanwilliam ..	0 12 3	..	0 13 3	0 8 0	0 9 0	..	0 6 0	..	..	0 8 9	0 0 9	0 0 6	0 0 7	0 1 4	0 1 0	..	15/-
Colesberg ..	..	..	..	10/- to 12/6	..	0 10 0	..	0 6 3	0 4 2	0 8 4	..	0 0 4	0 0 3	0 1 2	0 1 9	..	..
Cradock ..	0 14 0	..	0 15 0	0 6 6	..	0 7 0	0 7 0	0 5 0	0 4 0	0 7 5	0 0 9	0 0 4	0 0 3	0 1 0	0 1 3	..	..
Dordrecht ..	0 11 6	0 19 0	0 16 6	0 6 6	0 8 0	0 5 0	0 9 0	0 5 6	0 6 0	0 9 0	0 1 0	0 0 3	0 0 3¼	0 1 2	0 1 3	£10	12/6
East London ..	0 11 0	0 18 0	0 15 3	0 5 2	0 7 3	0 7 6	0 5 0	0 3 6	0 3 6	0 10 0	0 1 0	0 0 3	0 0 4	0 1 7	0 2 8	£10	19/-
Graaff-Reinet	0 10 6	..	0 14 0	0 6 6	..	0 8 6	..	0 4 0	0 3 6	0 9 0	..	0 0 4	0 0 4	0 1 1	0 1 3	£9	13/-
Grahamstown	0 9 3	..	..	0 6 2	..	0 5 0	..	0 3 3	..	0 9 6	0 0 5	0 0 6	0 0 6	0 1 6¼	0 1 5¼	..	..
Kimberley ..	0 12 6	0 17 0	0 15 6	0 5 0	0 6 8	0 6 4	0 6 8	0 5 2	0 4 10	0 9 0	0 0 5¼	0 0 8	0 0 5	0 1 0	0 1 2	£7 15	11/-
King William's Town ..	0 10 0	0 18 0	0 15 0	0 5 6	0 6 6	0 5 6	0 4 0	0 3 0	0 3 0	0 7 9	0 0 6	0 0 5	0 0 5	0 1 6	0 1 0	£11	15/6
Malmesbury ..	0 11 0	0 14 6	0 12 6	0 9 0	..	0 7 0	0 5 0	0 3 9	..	0 10 0	0 0 9	0 0 6	0 0 6	0 1 4	0 1 4	£10	18/-
Mossel Bay ..	0 9 0	0 18 0	0 16 0	0 6 0	..	0 5 6	..	0 3 6	..	0 9 0	..	0 0 5	..	..	0 1 3	..	..
Port Alfred ..	0 12 0	1 0 0	0 18 0	0 6 0	0 10 0	0 10 0	0 11 0	0 3 0	..	0 9 0	0 0 8	0 0 6	0 0 6	0 1 0	0 1 0	£10	15/-
Port Elizabeth	0 9 6	..	..	0 6 3	..	0 5 3	0 5 6	0 3 9	..	0 11 0	..	0 0 6	0 0 6	0 1 5	0 1 10	..	..
Queenstown ..	0 14 6	0 16 6	0 13 6	0 5 0	0 8 6	0 9 0	0 9 0	0 5 6	0 4 0	0 10 0	0 0 6	0 0 4	0 0 5	0 1 3	0 1 6	..	..
Tarkastad ..	0 11 9	1 1 0	0 14 9	0 6 6	0 12 0	0 6 0	0 5 6	0 4 0	0 3 6	0 7 6	0 1 0	0 0 3	0 0 3	0 1 2	0 1 2	£7	15/-
Vryburg ..	0 15 0	1 0 0	0 16 6	0 5 0	0 7 0	0 11 0	0 9 0	0 3 0	0 5 6	0 10 0	0 0 4	0 0 8	5d. to 7d.	0 1 3	0 1 6	£7 to £8	10/- to 12/-
Worcester ..	0 11 6	0 15 0	0 12 6	0 7 3	0 8-3	0 7 0	0 5 6	0 4 0	0 4 6	0 8 0	0 0 6	4d to 6d.	0 0 4¼	0 1 6	0 1 3	£8	13/6

NOTE.—A blank space denotes "no transactions."

PRODUCE MARKETS.

CAPE TOWN.

The Produce Department of R. Müller, Cape Town, reports for the month ending June 30:—

Ostrich Feathers.—The London Sales held last month brought the welcome news of a sharp advance on common and medium quality feathers. The effect of this has been, that many held up parcels changed hands at, what under the circumstances must be considered, satisfactory prices.

	£	s.	d.	£	s.	d.
Super Primes ...	15	0	0	35	0	0
First, ordinary to Super ...	12	0	0	17	10	0
Seconds	7	10	0	9	10	0
Thirds	3	0	0	5	0	0
Femina Super ...	10	10	0	17	0	0
Do., Seconds to Firsts ...	4	10	0	10	0	0
Byocks (Fancy) ...	5	0	0	9	0	0
Long Blacks	3	10	0	7	0	0
Medium Blacks ...	1	10	0	3	10	0
Short to Medium ...	0	10	0	1	5	0

	£	s.	d.	£	s.	d.
Floss	0	5	0	1	15	0
Long Drabs	2	0	0	4	0	0
Medium Drabs ...	0	15	0	1	10	0
Short to Medium ...	0	5	0	0	15	0
Floss	0	5	0	1	15	0
White Tails	1	5	0	2	10	0
Coloured Tails ...	0	5	0	2	0	0
Chicks...	0	1	0	0	2	0
Spadonas	2	10	0	5	0	0
Inferior Black and Drabs, short to long	0	0	6	1	10	0

Wool.—During the past month the market has been fairly well supplied, considering the lateness of the season. Prices have been firm throughout for all Wools showing quality and good yield. Heavy and wasty lots are somewhat difficult to move. Long light Calvinia clips continue to realise up to 6½d., Karroo from 5d. to 7½d., according to quality and length. Coarse and Coloured is in good demand.

	s.	d.	s.	d.
Super long Grass Veld	0	7¼	0	8½
Do. Karoo ...	0	5½	0	7½
Medium	0	4	0	5¼
Short and inferior ...	0	3½	0	4
Wool for Washing	0	4½	0	5½
Snow-white Super to Extra	1	4	1	7
Do. Ordinary ...	1	1	1	4
Fleece Washed	0	0	0	9

Mohair.—During the beginning of last month, the market was lively, and a considerable advance in prices took place. Later on demand slackened somewhat, and enquiry to-day is not quite so brisk.

	s.	d.	s.	d.
Firsts, Summer	0	9	0	11½
Kids	1	2	1	9
Seconds ...	0	5	0	6½
Winter ..	0	8	0	8½
Do. Kids..	0	11	1	1½

Hides and Skins.—The market has been firm throughout, and the tendency is for an advance.

	s.	d.	s.	d.
Long woolled Skins ...	0	5½	0	6¼
Short...	0	4¼	0	4¾
Shorn	0	3¼	0	3½
Bastards	0	3½	0	4
Cape Skins, each	2	0	2	7
Do., cut, each ...	0	0	1	8
Goat, heavy to light ...	0	11	1	1
Sundried	0	0	0	6
Angoras	0	5½	0	6
Sundried Hides	0	5½	0	7½
Salted	0	5	0	6½
Wet...	0	3½	0	4½

PORT ELIZABETH.

Messrs. John Daverin and Co., of Port Elizabeth, report under date June 25:—

Ostrich Feathers.—The market was again well supplied this week with a fair average assortment. Competition was fairly keen for all good qualities, but ordinary and common sorts were irregular, and at times prices were decidedly lower, buyers evidently having little confidence that the advance made at the recent London sales will be maintained. The total quantity sold on the market amounted to £16,768 7s. 8d., and weighed 7,463 lbs. 2¾ ozs. Little or no business has been done out of hand. The stock held here still continues large, and it is not possible to sell consignments on the market until four or five weeks after they arrive, and this is without allowing any time for sorting the pluckings. This is chiefly accounted for by the fact that this is the plucking season, and practically no business is being done out of hand. From this month the quantity will ease off again for another few months. Our cable received on Wednesday reports that the quantity offered on the July sales will amount to about £240,000; and that prices are expected to be maintained.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
Primes: Extra Super	Special Prices.		Blacks: Long	2 0 0	to 7 0 0
Good to Super ...	20 0 0	to 40 0 0	Medium	1 5 0	,, 4 0 0
Whites: Firsts ...	12 10 0	,, 20 0 0	Short	0 4 0	,, 1 5 0
Seconds ...	5 0 0	,, 10 0 0	Wirey	0 0 3	,, 0 0 6
Thirds ...	1 0 0	,, 5 0 0	Floss	0 5 0	,, 1 7 6
Feminas: Super ...	12 15 0	,, 20 0 0	Drabs: Long...	1 0 0	,, 4 0 0
Firsts ...	6 10 0	,, 12 10 0	Medium	0 10 0	,, 1 15 0
Seconds ...	2 10 0	,, 6 10 0	Short...	0 1 6	,, 0 7 6
Thirds ...	0 15 0	,, 2 10 0	Wirey	0 0 3	,, 0 0 6
Greys ...	1 10 0	,, 0 0 0	Floss...	0 5 0	,, 1 10 0
Fancy	3 0 0	,, 8 0 0	Spadonas: Light	0 5 0	,, 4 10 0
Tails: White	0 5 0	,, 2 0 0	Dark	0 2 6	,, 3 0 0
Light	0 5 0	,, 1 15 0	Chicks... ...	0 0 0	,, 0 5 0
Coloured & Dark	0 0 6	,, 0 15 0			

The following may be quoted as the approximate current values of unsorted parcels, per line:—

	Whites.	Feminas.
Superior pluckings	£8 10 0 to £10 0 0	£6 0 0 to £7 10 0
Good Average lots	7 0 0 to 8 0 0	4 10 0 to 5 10 0
Poor Average lots	4 10 0 to 5 10 0	2 10 0 to 3 0 0
Common lots, stalky, narrow and discoloured	2 10 0 to 4 0 0	1 5 0 to 2 5 0

	Tails. s. d. s.	Blacks. s. d. s. d.	Drabs. s. d. s. d.	Spadonas. s. d. s. d.
Good	12 6 to 17	20 0 to 40 0	12 6 to 15 0	30 0 to 40 0
Average	7 6 to 8	15 0 to 20 0	7 6 to 10 0	15 0 to 27 6
Poor	2 6 to 5	10 0 to 12 6	5 0 to 7 6	2 6 to 7 6

It will be understood that for Special Lots, these quotations may be exceeded.

Wool.—There is nothing new to report in this market, which continues steady, except for heavy and faulty grease, for which there is no demand. Stocks and new arrivals are small, the season being over. On the Public Market yesterday a fair quantity was offered, prices ruling weaker.

Snowwhite, Extra Superior ...	17½d to 18d
Do. Superior	16d ,, 16½d
Do. Good to Superior...	15d ,, 15½d
Do. Inferior Faulty ...	13d ,, 14d
Grease, Super Long, well-conditioned, Grassveldt	8d ,, 9¼d
Do. do. do. ...	7d ,, 8d
Do. do. Karoo grown (special clips)	6¾d ,, 7½d
Do. do. do. ...	5¾d 6¼d
Do. do. Mixed Veldt...	6d ,, 6½d
Do. Light, faultless, medium Grassveldt grown ...	6d ,, 7d
Do. do. Karoo grown	6d ,, 6
Do. do. short, do.	5¼d ,,
Grease, Coarse and Coloured ...	1d to 3½d
Scoured do. do. ...	2d ,, 9d
Basuto Grease, short	6d ,, 6½d
O.R.C. Grassveldt Grease, long & well-conditioned (special clips)	6d ,, 7¼d
Do. do. do. ...	5¾d ,, 6½d
Do. do. medium grown, light, with little fault	5½d ,, 6¼d
Do. do. short, faulty & wasty	4½d ,,
Do. do. Karoo grown, long & well-conditioned ...	5¼d ,, 5¾d
Do. do. medium grown, light with little fault ...	4½d ,, 5d
Do. do. short, faulty and wasty...	3¾d ,, 4d

Mohair.—This Market has been very quiet during the week, and only a small business has been done in the open market, but we think the lull is only a temporary one, and was only to be expected after the large business done last week (when about 2,500 bales changed hands). We still have the greatest confidence in the market, and have little doubt that we will soon see a move again. The bulk of the clip has now arrived, and the stock amounts to about 4,500 bales, which is less than the old stock with which we started the 1908 season. Besides this, there is no old stock in London except 500 bales of ordinary Firsts, against 4,000 bales a year ago. The chief reason given last year for the slump was that the supply was in excess of the demand. Nevertheless it appears to have been absorbed, and now we have about the smallest quantity to deal with that we have had for years; consequently we think it only reasonable to expect a good market in the near future. On the Public Market on Tuesday a fairly large quantity was offered, chiefly made up of mixed parcels, for which competition was less active than last week, and prices were easier.

Super Kids	23d to 24d	Mixed O.R.C. Hair (average)	8½d to 10d
Ordinary Kids and Stained ...	18d ,, 22d	Do. very mixed	7d ,, 8d
Superior Firsts, special clips ...	12¼d,, 12¾d	Seconds and Grey ...	5d ,, 6d
Ordinary Firsts...	11½d,, 12d	Thirds	4½d,, 4¾d
Short Firsts and Stained ...	10d ,, 10½d	Winter Kids, special clips	14d , 14½d
Superfine Long Blue O.R.C. Hair	10d ,, 10½d	Do. good ordinary	13d , 14d
		Winter Hair	9d , 9d
		Basuto Hair	8½d , 9d

Skins.—Sheepskins sold this week in bundles at 5½d. and Pelts at 4d.; Capes 22d.; damaged, 7d. each; Goatskins, 12¼d.; damaged, 6d. per lb., and Heavy Goatskins, 8½d.; Angoras, 6½d.; Shorn, 5d.; damaged, 3d. per lb.; Johannesburg Sheep, 5d.; Goats, 9d.; Angoras, 6d.; Springbok, 8½d. each.

Hides.—Sundried, 8½d., damaged, 7½d., Salted, 7½d., damaged, 6½d., Thirds, 3½d.

Horns.—3½d. each all round.

EAST LONDON.

Messrs. Malcomess and Co., Ltd., report for the month of June:—

Wool.—During the past month advices report all markets quiet with an easier tendency. The reason is that the trade is busy digesting the huge quantities of Wools brought from all the Wool producing countries, shipments of which have been very heavy indeed during March, April and May. In addition, during June, July and August (always looked upon as quiet months) manufacturers are mostly stock-taking or holiday-making. Values, in consequence of the extreme quiet, have turned against sellers during the past three weeks, and it would not surprise us to hear of London bringing a slight decline in the wool sales commencing there on July 6th. We do not look for any material decline because the visible supplies during the next four months are small in comparison to last year's totals, but, on the other hand, we cannot hold out much hope for any improvement later on in view of the close approach of shearing the next big Wool clip, not only in Australasia but also South America and South Africa.

The local market has become much quieter in sympathy with the European markets, and very little is doing. Arrivals have practically ceased, and available stocks are now reduced to 2,500 bales, mostly very heavy, short and faulty Grease.

Public Sales have been held every Wednesday during the month, but quantities offering have fallen off markedly, as the following shows:—26th Sale, 500 bales offered, 250 sold; 27th Sale, 1,500 bales offered, 400 sold; 28th Sale, 650 bales offered, 250 sold; 29th Sale, 500 bales offered, 150 sold.

To the above sales must be added 1,500 bales which changed hands privately, bringing the total sales for the month to about 2,700 bales, the smallest turn-over since the year began.

As stated, prices are against the holders, and have ruled on the following level:—

	6 months Summer Grease.		6 months Summer Grease.
Aliwal	4¼d to 4¾d	Cathcart (according to quality and condition)	
Burghersdorp, Heavy Red ...	4d 4½d	Stutterheim	
,, Bluish, Superior Stormberg	4¾d ,, 5¼d	O.R.C.:	
Dordrecht (according to quality and condition)	4¼ 4¾d	Northern (according to quality and condition) ...	5d 5¾d
Barkly East	5¼ 5½d	Wepener	4¼d 5d
Elliot	5¼d 5½d	Rouxville	4¼d 4½d
Molteno, Heavy Red	4¼d 4¾d	Zastron	4¼d 4½d
,, Superior Blue Stormberg	4¾d 5½d	Philippolis	5½d
Tarkastad, Heavy Red... ...	4¾d	Native:	
Light Blue ...	5¼d ,, 5¾d	Transkei	7d
Queenstown (according to quality and condition)	5¼d ,, 5¾d	Basuto	5¾d , 6½d

Mohair.—The strong speculative movement which began at the commencement of the Summer season continued on the up-grade until the middle of this month, when buyers realised that spinners were not following the movement. The top of the market was reached when we could sell Superior Kids at 24d. and Long Summer Super Firsts at 13d. However, during the past fortnight the market has become very quiet again and 22d. and 12½d. respectively are the best bids sellers can draw. From London the reports are that the market is quiet, and spinners will not pay parity of the highest prices paid here, with a fair demand for finest quality Hair, but that the higher prices asked by sellers checks business. Medium and low quality Hair show no improvement at all and are not wanted, unless obtainable at very reasonable rates.

We quote as follows:—

Goatskins, 11¾d. to 12d.; Angora skins, 7d. to 7¼d.; damaged, 4d. to 5d. each.

Hides at the beginning of the month went to 8¾d. for Sundried, and 7¾d. for dry-salted, but have dropped again to 8¼ and 7¼d., with a tendency to drop another ¼d.

Sheepskins have also become weaker in sympathy with an easier Wool market, and very bad Roan trade. We quote:—

Sound Woolled Merino Skins, 5¼d. to 5½d.

Pelts and Coarse, 3¾d. to 4d.

Transkeian parcels, 4d. to 4¼d.

Horns.—According to size and quality, 2d. to 4d. each.

APPLICATIONS FOR AGRICULTURAL EMPLOYMENT.

Strong and healthy young man, aged 23, good references, and medical certificate if necessary, is desirous of agricultural employment. In England at present, but can come out at any time. Reply to James Western, 10, Cambridge Road, Seven Rings, Essex, England.

Colonial born, speaking English and Dutch fluently, age 22 years, seeks employment as Under-Manager on good Ostrich and Stock farm in the Midlands or Eastern Province. Will accept reasonable salary. Has had five years' experience in agricultural, stock and ostrich farming, also 3 years postal and telegraph work. Address: J. R. Horne, P.O. Laingsburg, C.C.

Middle aged man with general experience of mixed farming, including stock, in Great Britain, is desirous of position as Under-Manager. Good references. Reply: James McGuffog, 9, Plein Street, Woodstock.

Strong, healthy Colonial, 20 years of age, fair knowledge of Dutch, one year's farming experience in Rhodesia, is desirous of employment on a large farm in the Colony. Address:—W. R. Bull, 20, Bond Street, Tambours Kloof, Cape Town.

G. Charters, Simmer Deep, G. M. Co., Germiston, is anxious to get into a dairy farm as a learner.

Married man, with thorough experience of Stock and Fruit Farming, seeks position as manager or overseer. Replies to be addressed "H.," Sherbrooke Siding, Bethlehem, O.R.C.

Practical Engineer, experienced in erecting plant, good knowledge of pumping gear, drilling, dam construction, irrigation work, and used to control of natives (also is a skilled mechanic), seeks employment where these abilities could be utilised, would undertake farm or mining work, piece, contract, or time engagement. Temperate, highest Transvaal, Cape, and Home references (technical and personal), free now. Write to P.O. Box 1289, Cape Town, or wire "CANNON," Cape Town.

BREEDERS' DIRECTORY & FARMING NOTICES.

Advertisements under this heading are inserted at the rate of 30 words for 2s. 6d., (minimum charge) per insertion, and 6d. per line of approximately six words above that number. Payment must accompany Order. Cheques and P.O.O. to be made payable to the CENTRAL NEWS AGENCY 125-127, Long Street, Cape Town, to whom all communications should be addressed.

OSTRICHES.

SPECIALS ONLY.—Choice pairs, £50 to £100 per pair.—F. W. BAKER, Laughing Waters, Willowmore.

OSTRICHES. — Young and old.—For further particulars, apply to Mr. R. S. DE VILLIERS, The Imperial Cold Storage and Supply Co., Ltd., Porterville Road.

PIGS.

BERKSHIRE BOARS.—Pure bred. Ages two to fifteen months. Bred by Charles Leonard, Esq. on his well known "Gloria" Estate—For further particulars, apply to Mr. R. S. DE VILLIERS, The Imperial Cold Storage and Supply Co., Ltd., Porterville Road.

PURE BRED BERKSHIRE PIGS.—Prize Winning Stock. Boars and Sows, £3 each. Also Buff Orpington and White Leghorn Poultry. —Apply MANAGER, Maitland River Farm, Green Bushes Hotel, Port Elizabeth.

CATTLE.

FRIESLAND BULLS, bred from the best IMPORTED stock, from a few weeks to fifteen months old.—For further particulars, apply to Mr. R. S. DE VILLIERS, The Imperial Cold Storage and Supply Co. Ltd., Porterville Road.

ENGLISH BREEDERS.— WILLIAM COOPER AND NEPHEWS, "Cooper Dip" Works, Berkhamsted, England. Shorthorn, Hereford and Polled Cattle; Shropshire Sheep; Berkshire and Large Black Pigs. 54 First Prizes at British Shows last year. Every facility given to Colonial Buyers. Send to W. C. & N., P.O. Box 305, East London, Cape Colony, for "Pedigree Stock and its Export," gratis and post free.

GENERAL.

SEED POTATOES.—You can save 50 per cent. by ordering your Seed Potatoes direct from England. Catalogue post free. Agents wanted. —BRINKWORTH & SONS, Growers, Southampton.

PASPALUM GRASS PLANTS.—Strong roots per Rail or smaller plants per Post to any address. See larger advertisement, page ix. this Journal.—A. C. BULLER, Dwarsriviers Hoek, Stellenbosch.

HEAVY YIELDING GRASSES.—The Celebrated *Paspalum Dilatatum*, unrivalled for butter or fattening stock. Price per lb., 6d.; freight 30/- extra to South African ports. The Wonderful Drought-resisting Rhodes Grass, 7/- per lb., p. free. Yield, about 12 tons per acre. Very nutritious and palatable to all classes of Stock. Gives good results under adverse conditions of soil and climate. Most strongly recommended to South African Stock Owners. Also *Grand, Couch & Paspalum* and the winter grasses, *Phalaris Commutata* and *Coerrulescens*, 3/- per packet each, from B. HARRISON, Burringbar, N.S.W., Australia. Cash must be posted with the Order.

THE POULTRY YARD.

WHITE LEGHORNS.—From two of the Best American Strains. Eggs, 3/6 per dozen. Cockerels, 5/- each, packed and delivered F.O.R. Correspondence invited. — C. R. PLUMBLY, "The Gums," Porterville Road, C.C.

BUFF ORPINGTONS, SILVER WYANDOTTES, BLACK MINORCAS. Winners of over 90 prizes. Bred for Utility and Show points. PULLETS from 10/-, also COCKERELS from 7/6. Will improve the table and laying qualities of common fowls. Mrs. R. F. DOTT, Kenilworth, Kimberley.

WRIGHT BROS., Highlands, Cape, Breeders of Black and Buff Orpingtons, White and Partridge Wyandottes, Black Langshans and Champion Laying WHITE LEGHORNS. Birds for Sale from 10/6 up. Terms Cash. Birds not approved may be returned. Please Note 400 Birds to select your wants from. Please mention this paper.

R. V. HAZELL, Tregenna, Park Road, Rondebosch, Breeder of White Wyandottes, Columbian Wyandottes and Black Orpingtons. My Wyandottes have won at all the leading Shows in South Africa, besides being excellent layers. I have procured a 1st Class Pen of Black Orpingtons from Graham Hope, who tops nests for layers and who has won handsomely all over the Transvaal. Correspondence and inspection invited.

WHITE LEGHORNS.—Best American Utility Strains. Settings of Eggs for sale, from pure-bred utility White Leghorns, F.O.R., 10/6 per setting of 15. Cockerels, 10/- to 20/-. Terms, cash with order. Mrs. W. L. STEEL, Stellenbosch.

BUFF ORPINGTONS. — THE FARMER'S FOWL. The fowl that LAYS WHEN EGGS ARE TOP PRICE. A 1 TABLE BIRDS. My Buffs have unlimited orchard and grass run, and are noted for hardiness and good laying qualities. Young stock always for sale at very reasonable prices. Ask for inclusive quotations; carriage paid to any station in South Africa and AT MY RISK to rail destination. My list of prizes won at shows all over South Africa will convince you that this unrivalled *Colonial* strain of 10 years' standing CAN HOLD ITS OWN AGAINST IMPORTED STOCK. Buy hardy Colonial-bred birds and save your pocket. Address: A. C. BULLER, Dwarsriviershoek, Stellenbosch.

ANGORA AND MERINO RAMS.

The following members of the Bedford C.C. Ram Breeders' Association will hold Public Sales of all Rams they breed for Sale (now sold privately on farm), on the Second Thursday in September October, January, March, at 11 o'clock, at Bedford :—

PRINGLE BROTHERS, Glen Thorn, P.O. Linton, Adelaide.
C. W. WEBBER, Havelock Holme, P.O. Bedford.
T. W. KING, Kingsvale, P.O. Bedford.
A. A. HOCKLY, Cullendale, P.O. Bedford.
W. D. HOCKLY, Commando, P.O. Bedford.
E. J. PRINGLE, Penderny, P.O. Bedford.
KEITH ROSS, Carvers, P.O. Bedford.
PAINTER & LEONARD, Prospect, P.O. Bedford.
&c., &c., &c.

All particulars and Catalogues to be obtained from the above.

Clients not being able to attend may place their orders with any of the Breeders, who (on satisfactory reference being given), will buy for them at the Sale.

THOMAS WM. KING, President.
T. C. HALL, Secretary.

Wanted by Young Colonial, 16 months experience, good Testimonials, Situation on Farm as Assistant.—Apply G. E. BOWER, "Summer Pride," East London.

THE

Agricultural Journal

OF THE CAPE OF GOOD HOPE.

No. 2. AUGUST, 1909. VOL. XXXV.

Published Monthly in English and Dutch by the Department of Agriculture and distributed gratis to bona fide farmers in the Cape Colony on application through the Resident Magistrate of the District.

SUBSCRIPTION 5s. PER ANNUM. Post Free in South Africa.
Remittances to be made Payable to the Publishers CAPE TIMES, LTD., Church St., Cape Town.

Postal Address:
The Editor "Agricultural Journal," Department of Agriculture, Cape Town.
Telegraphic Address: "Bulletin," Cape Town.

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NOTES.

Letters Enclosed in Report Forms.

Farmers sending in reports on seeds sent from the Department of Agriculture are asked not to enclose or embody letters in the report, as these forms are sometimes set aside owing to pressure of work. This has happened this season when applications for seeds have been sent and not noticed until recently, consequently the seeds have not been supplied as it is now too late in the season.

Sponsziekte (Quarter Evil) Vaccine.

Sponsziekte (Quarter Evil) Vaccine is now prepared at and procurable from the Veterinary Laboratory, Graham's Town, at a price of sixpence (6d.) per dose. All applications for this Vaccine must be addressed either to the Director of the Veterinary Laboratory, Graham's Town, or to Civil Commissioners, and *must invariably be accompanied by remittances* in cash, postal orders, money orders or drafts. Cheques will not be accepted.

Apprentices, Government Wine Farm.

Applications will be received in writing by the Under Secretary for Agriculture from persons (single) desirous of being apprenticed at the Government Wine Farm, Groot Constantia, for a period of not less than one year and not more than two years. Not more than eight applications will be accepted. Successful applicants must pay to the Government a sum of £40 per annum, in monthly or quarterly instalments, payable in advance, to cover the cost of their board and lodging, and must give their services free in return for the instruction imparted by the Manager of the Farm. They must carry out any orders received from the Manager or his representative, and any wilful disobedience or other misconduct will entail dismissal without notice.

The instruction which will be given will be practical, and consist of the cultivation, pruning and general management of vineyards and of orchards; wine making and maturing, etc.; the analysis of wine as far as this is requisite for a producer; and the general work of the farm.

Cape Fruit in Rhodesia.

The Department is advised by the Director of Agriculture, Salisbury, that no objection will be made on the part of his Administration to the return, on request, of rejected consignments of fruit to consignors in this Colony.

Eelworm in Potatoes.—Transvaal Restrictions.

Information has been received that the Department of Agriculture has been officially notified to the effect that it has been deemed advisable by the Transvaal authorities, in view of the large quantities of eel-worm infected potaties which have been forwarded to that Colony from the neighbouring territories, to institute a system of sorting whereby all consignments of potatoes showing any trace of disease will be sorted upon arrival at the expense of the consignee. Further details of the scheme, we are advised, have not as yet been definitely worked out, but these will be notified when received.

Poultry Plucking Device.

"Formerly when plucking ducks or geese we picked," says an American housewife, "into a boiler or tub and then had to fill the sacks by hand. Now we drive nails in the top of a nail keg and pick directly into that, thus saving much time.—"Prairie Farmer."

Lucerne and Pigs.

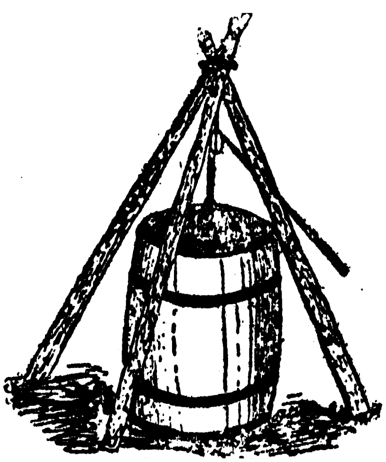
No community with high-class swine prominent in its husbandry (says F. D. Coburn in "Swine in America) is poor. No community with large areas of alfalfa (lucerne) can afford to neglect swine husbandry, for its people possess the material for economical pork production equalled by no others. As a pastime or soiling crop for sows and young pigs, alfalfa proves a wonderfully helpful ration for milk-making in the sow and for growth in the pigs. Experiments have shown that pigs make better growth when the dam is fed with considerable alfalfa than those from sows fed with the best of commercial rations but with no alfalfa. Of two sets of pigs, one fed with clover, rape and soaked corn, and the other with access to alfalfa in lieu of clover and rape, those having alfalfa seemed to grow the more rapidly. For brood sows it is a most valuable food, either as hay, a soiling crop, or as pasture. The litters of such sows are generally large and vigorous, and the dams have a strong flow of nutritious milk. Alfalfa meal in slop may be used with profit where the hay is not to be obtained. It is also claimed that sows fed on alfalfa during pregnancy will not devour their young, its mineral elements seeming to satisfy the appetite of the sow, while contributing to the fetal development of the pigs.

On a farm of former Governor Hoard, in Jefferson County, Wisconsin, all the brood sows have for several years been wintered on alfalfa hay of the season's third cutting, and their drink (skim milk from the dairy), without any grain until the last two weeks of gestation. Mr. Hoard says the object is to give the sows a food that will keep them in a non-feverish state and furnish protein sufficient to build the bodies of the forthcoming pigs. A Finney County Kansas farmer reports having pastured 30 pigs on one acre of alfalfa from May 1st to September 1st, when they weighed

100 pounds each and were in fine condition for fattening. Another Kansas farmer reports keeping 100 pigs from about the middle of April to September on five acres of alfalfa pasture. A little grain during the last two months would have gained him many pounds of pork. Many alfalfa-raising pig-growers insist that their pigs can be maintained from May to October on alfalfa for one-half what it would cost for almost any other feed.

The Utah station found that young shotes gained one-third pound a day on alfalfa pasture without grain. But the station found also that the gain was not so great in older hogs. A Wisconsin dairyman reported that he kept nine sows all winter and spring on alfalfa hay and skim milk, without any grain, and raised from them 75 pigs, all healthy and vigorous. The Colorado station considers that a ration of three-fourths corn (mealies) and one-fourth alfalfa hay is the best for fattening hogs for market, but for young hogs not ready for fattening the proportions should be reversed. The station does not recommend grinding alfalfa hay for hogs, probably on the theory that the hog's time is not worth much at best, and he can do his own grinding.

A Simple Hog Scalder.



The illustration will show how to set up an easily constructed hog scalder that will save much lifting and time. Three 16-ft. poles are held together at the top with ropes, and set over a scalding barrel; a small block with rope is hung from the top, which has a rather sharp hook at its lower end. The dead hog is brought to the barrel on a wheelbarrow, and the hook either made fast to one leg or a gambrel stick. If necessary the hook may be fastened in the roof of the hog's mouth, as is done at the packing houses. The hog is easily lifted from the barrow, scalded, replaced, and taken to the scraping or cleaning table. The device seems rather crude; but once used, its advantages will be appreciated.

Exportation of Ostriches and Ostrich Eggs.

As legislation has been enacted and promulgated, prohibiting the exportation of Ostriches and Ostrich Eggs from German South-West Africa except to such South African States and Colonies as have enacted similar prohibitive legislation, the exportation of Ostriches and Ostrich Eggs to German South-West Africa is *ipso facto* permitted.

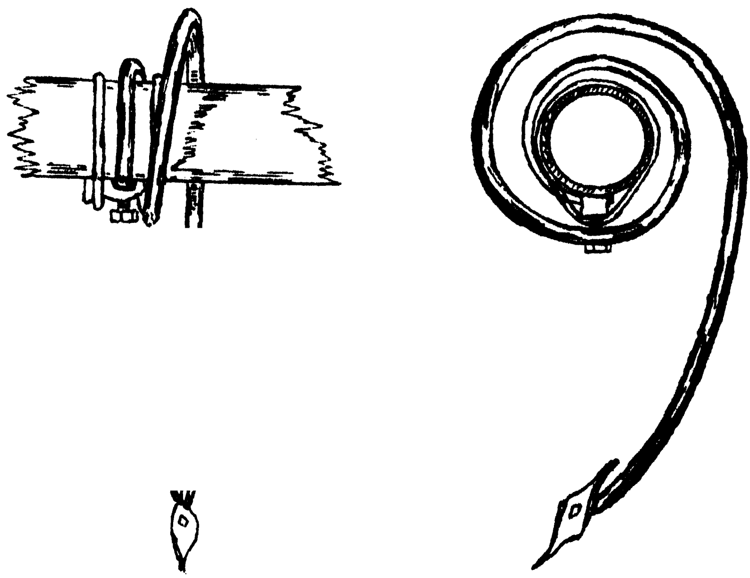
Mealies Grown on "Dry Lands."

The De Beers Company is offering, at the next Bloemfontein Show, a prize of £20 for the best exhibit of maize, to consist of three-muid bags of grain and one-muid bag of ears of one variety, South African grown, on "Dry Lands." The bag of ears to be representative of the crop from which the grain was threshed. A certificate must accompany each entry, signed in the presence of a Field-cornet or J.P., stating that the exhibitor has produced at least 200 bags of maize on dry lands during the season, and that this particular exhibit was grown without irrigation.

Another New Lucerne Cultivator.—The Ross-Courtney.

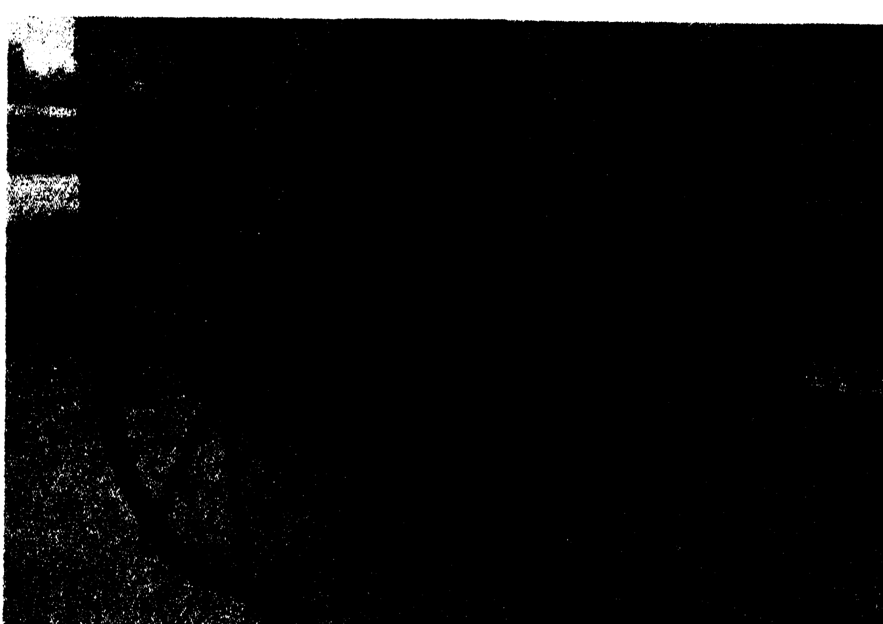
Another new lucerne cultivator has been brought to our notice, and as it promises to do more towards satisfactorily solving the several problems involved in this work we have no hesitation in bringing it prominently before our farmer friends. The new machine is named the Ross-Courtney Cultivator, and is the invention of Mr. John Courtney, of Aviemore, Elsie's River, near Cape Town. It is, undoubtedly, a great advance upon anything at present on the market, and will, we believe, prove particularly applicable to those districts where quick and other grasses are so troublesome in lucerne lands. The illustrations herewith will give some idea of the main parts of the implement. The new principles disclosed—though perhaps the word "disclosed" is inappropriate and the word "applied" should be used—are first the form of the spring tine, and secondly the shape and make of the cultivating tool. It will be noticed in the photograph of the complete machine that the spring tines are formed on the lines of a conical spiral spring. The details of this spring are shown better in the rough sketch of same. The advantages of this tine will be at once manifest to users of this type of implement. Being made of five-eighths finely tempered steel, it contains in itself a high degree of resiliency. This is accentuated by the careful grading of the coil and the set on the beams, while another point of importance is the exact manner in which the lower sweep of the tine is shaped. This gives the maximum of power for agitating the soil as the point of the implement works through, and entirely obviates any dragging or tearing action. The second feature, the shape adopted for the cultivating tool itself, is of even greater importance. There are a good many spring tine cultivators on the market, and several varieties of cultivators which combine this principle with others, but we know of none which gives the action of an augur and plough at one and the same time as this seems to do. The digging screw action forces the tool into the ground, and is well calculated to drive it even into very hard soil, while the plough shape compels almost perfect cultivation by throwing up the soil on the miniature mould board and depositing it well pulverised. At the same time no injury could be inflicted on the lucerne plants while all weeds and shallow-rooted growth must be turned over to perish.

The actual machine photographed for the illustration herewith is one that was specially made for the Smartt Syndicate, Britstown, and as special conditions have to be met in this case, the tine and cultivator were made by request in one piece. In the implements being put on the market these parts are separate as is shown in the rough sketch. Thus wear and tear on the tool does not interfere with the machine. The cultivators are double-ended and reversible, and are attachable to the tines by strong screws and nuts. As it is necessary for general purposes that the tines



Rough sketch showing construction of conical spiral spring and cultivating tool on Ross Courtney Cultivator.

should be adjustable at different depths in the soil the whole frame is set on a lever which can be raised or lowered as required from the driving seat. It is hoped that later on further improvements may be made by which the scope of this machine may be extended. So far the only additional use the machine has been put to is by turning it into a seeder. This



Ross-Courtney Cultivator, specially made for the Smartt Syndicate, Britstown.

was done by setting a seed box between the two rows of tines, the front row thus opened up small furrows while the back row of tines covered them in again after the seed was sown. As to the construction of the machine we can only state that this part is in the hands of Messrs. Cunningham & Gearing, the well-known engineering firm of Ebenezer Road, Cape Town. And so far as can be judged none but the best and most suitable material is being used. The frame is of tee and angle steel, being thus light and strong, the wheels are on the most modern approved lines, being built entirely of metal with broad tires. It can be fitted with a disselboom or run with a leading wheel, and the whole is so light in draught that a single workman trots it about the workshop and yard with ease. As we fully anticipate that this implement will soon take a recognised place among the cultivators in general use we can only add that all further information can be obtained from either the inventor, the makers, or Messrs. R. M. Ross & Co., Cape Town, who have taken up the general agency. The machine is covered by provisional patents in South Africa, America, and Europe, but from what we can learn the object is to get it on the markets of the world at as reasonable a price as possible, compatible with reliable workmanship and good material.

Destruction of Testicle Duct v. Castration

Dr. Wm. Robertson, M.D., of Durban, has forwarded a communication in which he advocates the destruction of the testicle duct (*vas deferens*) as being more advantageous for farm stock than the common practice of castration. He maintains it to be quite certain that were the question to be settled for the first time in these days scientific opinion would entirely favour the retention of the testicle, and continues:—"So greatly does the oblation of their organs upset the physiological balance of the system that it stands self-condemned. The operation of castration itself often leads to the loss of individuals due to shock and hæmorrhage, not to mention the severe pain and subsequent suffering. Destroying the duct through an incision is unattended by such grave results. The two cords can be protruded through the single incision, cleaned, and a piece from each cut off, observing, of course, strict cleanliness at each step of the operation.

"The testicle, as is now well known, possesses two secretions; the one the seminal secretion, the other the internal secretion. By the above operation the internal secretion is retained while the seminal secretion is abolished just as effectually as by castration. It can be understood how imperative it is for the maintenance of the economy of the system that this internal secretion should be retained when it is known that this secretion is necessary for the complete function of the blood-making organs (supra renal capsules) and the nervous system (medulla oblongata). Animals so treated might be expected to retain the character, appearance and nervous energy of the entire animal. But the most important part of all is that such animals would withstand infectious diseases better than castrated animals. In flesh, hide and wool, too, animals treated by this new operation would be found to excel. Especially in the case of animals used for transport would this new treatment be found an advance and a gain. Increased bulk of muscle, an unimpaired nervous system, and a vigorous, rich, blood stream, as intact as in the entire animal, would render animals healthier, stronger and more full of pluck. The operation abolishes the sexual instinct as effectually as castration. So satisfactory from every point of view is the operation and its results that the wonder is that it has remained so long in abeyance."

The Other Side of the Medal.

As most of our practical farmer readers will at once realise, there is another side to this question, and though the statement of the case as put forward seems entirely convincing, a little thought and practical experience will show that it is not entirely applicable for the purposes of the stock farmer. We will leave aside the consideration of the comparative delicacy of such an operation as is described above, when it has to be carried out by stock farmers and the crude help at their command in a country like this. Our correspondent seems to overlook the fact that castration has to be carried out on a wholesale scale when applied to the semi-ranching conditions which prevail over the greater part of the stock-farming sections of this country. It would be interesting to know how he would organise the work of carrying out this operation with, say, a few thousand lambs, or a large flock of Angora goats.

It has also to be remembered that the operation of castration, when properly performed, never leads to "loss of individuals due to shock or hæmorrhage." In England and other European countries it is rare indeed that one hears of severe hæmorrhage complicating the operation; one certainly never hears of loss of individuals due to shock or hæmorrhage—that is, of course, when, as is usually the case with large stock in those countries, the operator is a duly qualified veterinarian. In South Africa the castration of domestic stock is, of necessity, performed by the owner—the farmer—as in many cases a professional man is not available. In such conditions is it suprising that, as sometimes happens, the crude methods adopted lead to serious hæmorrhage? And regarding the severe pain and subsequent suffering. Granted that the operation is a painful one, the subsequent suffering cannot be so very great, for it is by no means unusual to see a colt commence grazing immediately after the operation is completed. One could hardly expect him to do so if suffering much pain. Further he will continue to eat and conduct himself in much the same way as he did prior to the operation. At no time should he manifest pain, nor indeed does he do so, after the operation is finished.

Our correspondent seems to lose sight of the objects of castration. With regard to horses, the gelding is usually more tractable than the entire; moreover he can be worked in company with mares, a proceeding rarely safe in the case of the uncastrated male. The castrated sheep fattens more quickly than the entire, and the same applies to the other domestic animals. For these reasons, and to prevent undesirable animals begetting their like, the operation of castration is performed. Emasculation, removal of the testicles, not only renders the animal incapable of propogating his species, but it also abolishes the sexual impulse. Vasotomy—that is simple division of the *vasa deferentia*, the testicular ducts —sterilises the animal it is true, but it does not abolish the sexual instinct or desire, and consequently this operation is useless for the domestic animal. There is no demand for animals which, though sterile, are still possessed of the sexual instinct.—W.J.

The Ages of Cattle.

For the purpose of settling any disputes at any time that may arise out of protests made against exhibitors who show animals out of their class, from the standpoint of ages, the management of the International Live Stock

Exposition has adopted the following specifications as a basis for determining the ages of cattle:—

Twelve Months.—An animal of this age shall have all of its milk (calf) incisor teeth in place.

Fifteen Months.—At this age centre pair of incisor milk teeth may be replaced by centre pair of permanent incisors (pinchers), the latter teeth being through the gums but not yet in wear.

Eighteen Months.—The middle pair of permanent incisors at this age should be fully up in wear, but next pair (first intermediate) not yet cut through gums.

Twenty-four Months.—The mouth at this age will show two middle permanent (broad) incisors fully up and in wear, and next pair (first intermediate) well up but not in wear.

Thirty Months.—The mouth at this age may show six broad permanent incisors, the middle and first intermediate pairs fully up and in wear, and the next pair (second intermediate) well up but not in wear.

Thirty-six Months.—Three pairs of broad teeth should be fully up and in wear, and the corner milk teeth may be shed or shedding, with the corner permanent teeth just appearing through the gums.

Thirty-nine Months. Three pairs of broad teeth will be fully up and in wear, and corner teeth (incisors) through gums but not in wear.

These specifications are based upon a large number of observations made upon animals of various ages, and may be used by those who purchase young animals to use permanently in their herds as a means of determining their ages should they be in doubt as to their being such as they were represented to be by the sellers. Of course animals that are well fed and forced to early maturity from forced feeding frequently have their teeth appear considerably before the usual time that these make their appearance, but the above specifications may be relied upon as a good guide, as they reasonably allow for such cases. A matter of a few months does not make much difference except in very young animals.

What to Look for in a Brood Sow.

It is not such a difficult thing as might be expected to go into a piggery with a large number of the usual cross-bred and mongrel sows, and pick out the sows which produce the best litters. Milk production and general maternal capacity are associated with certain characteristics in pigs as in dairy cattle, and a little study of type in pigs will enable anyone to pick out the most profitable sows to use for breeding purposes. Before indicating what to look for, it might be as well to state that there should be no second look at the pretty little sow. She is a charming, picturesque animal, round and beefy, small points and fine bone, just the sort of pig to make a carcass butcher glad, and such is her best destination. In the breeding pen her litters will be small, her milk secretion will be light, and her progeny will not develop with the intensity of vigour which is the best thing to drive pigs to a profitable death. The refined Berkshire is a good illustration of this type and should be avoided in the breeding pens. It will be found that in most instances the sow, which is the very antithesis of this, is the best parent. Her body is long, deep and comparatively narrow. It should be remembered that the digestive organs of the brood sow play, perhaps, the most important part in her career. They are called upon to do more work at certain times than the digestive organs of any other animal, and the success of her litters is largely determined by the amount of food which they can make ready for

conversion into milk. Hence it is that length and depth in the body are exceedingly important features in a sow for breeding purposes. The next thing to look for is a well-formed udder, free from badly developed patches or calloused parts. The phlegmatic, sleepy sow is to be avoided. Good mothers are generally somewhat nervous like dairy cows. Milk secretion has been proved to be largely a nervous function, and the dull somnolent cow is seldom a mother of high order. A good backline is a useful point. Hollowed backs are not safe; they should at least be level, and if slightly arched, so much the better.

Many, when choosing sows, avoid those coarse in their points, but this is a mistake, for the type of sow referred to is generally somewhat coarse about the head and long about the legs. The latter point is a good one, for, unless such a sow had longish legs it would be found that as she approached farrowing time, her udder would become chafed and sore from contact with the ground. The best brood sows will generally be found to be "clean" in the jowl and shoulder, their head, neck and shoulder suggesting those of the Jersey cow. It is thus seen that the sows recommended for breeding purposes are not in the least like the animal they are required to produce for the butcher; indeed they may be said to be the opposite type. Consequently the boar should be a good specimen of the meaty type, like the Berkshire. It will be found that the offspring take after the sire largely in external form, and the vigour, constitutional strength and digestive capacity of the mother will be inherited to the resultant benefit of the breeder.—*Western Australia Journal of Agriculture.*

Town Milk Supply.

An interesting lecture on the subject of Town Milk Supply was delivered at Catlin's Arcadia, Scarborough, England, on the night of July 2nd, by Mr. Loudon M. Douglas, of Edinburgh, who is well known as a lecturer and an author in connection with this subject. The lecture was illustrated by means of a large number of lantern slides, illustrating various aspects of the question, and an interesting demonstration was also given of the contents of the milk, each constituent being shown in a separate bottle, which is a graphic way of demonstrating how the lactic fluid is built up. The lecturer pointed out how important the milk supply was as a factor in the health of the nation, and how the intimate study of the question had only begun within the last quarter of a century. During that period, however, a large literature had grown up in connection with the subject in all civilised countries, and many difficult problems had presented themselves in connection with the original researches which had been made. Although at the present day, we know a good deal about milk, there were yet many things which were unexplained. The article which was spoken of in connection with the milk supply was cow's milk, and it was estimated that 1,723 million gallons were produced in the United Kingdom, of which 620 million gallons were consumed as milk, the remainder being utilised for butter and cheese. The consumption worked out to 15 gallons per head of the population, which, however, was behind the United States of America, where 25½ gallons per head of the population were consumed. In order to get this quantity, we required a stock of a little over 4½ million cows, and these were valued at £40,000,000 sterling, showing how gigantic an industry dairying was in the United Kingdom.

The lecturer proceeded to describe the physical properties of milk, and mentioned that one single drop contained many millions of the fine fatty globules which constituted cream, and these globules were so finely divided that it was stated that if a person attempted to count them, it would take him ten years, provided he counted 100 per minute and worked for six days in every week.

The various breeds of cows were touched upon, and it was shown that the Dutch breed had so far excelled all others in producing a cow which gave for one year a total of 2,743 gallons, which is rather more than six times the quantity given by the average cow in the United Kingdom. The sensitiveness of milk to odours and germs of disease was then touched upon, and the necessity for cleanliness and hygienic conditions was urged. Cleanly conditions were absolutely necessary to a wholesome milk supply. Tuberculosis was the principal disease which had to be dreaded in milk, and it was shown how this micro-organism could be injected into the system in a very simple way, through the milk supply, and it was one of the principal objects of the Milk and Dairies Bill, which had been recently issued, to try and prevent the spread of disease from tuberculosis. All diseases which could be milk-borne could, however, be controlled by means of heat, and this was called pasteurisation. It meant the total destruction of pathogenic or disease-producing germs in the milk. The average temperature used in pasteurisation or heating the milk was 176°F., at which figure, tuberculous germs were totally destroyed and all of the ordinary disease germs also.

The apparatus in connection with the application of pasteurisation was extremely ingenious, and was fully illustrated and described. It had now become universal throughout the dairying industry, and it was therefore a splendid thing for the milk consumers that they could rely upon the milk which they took, being thus rendered wholesome and free from any hidden danger. It had been said that the pasteurising process was disadvantageous, as it produced carelessness on the farm, and also that it affected the digestive properties in the milk, but those objections were only a minor character. The only real objection was that the pasteurising process increased the cost. There were few people, however, who had taken the trouble to study the question, but would acknowledge that the increased expenditure was amply justified.

Cyllin for Bluetongue.

Messrs. Otto Landsberg & Co., the agents for Jeye's preparations, forward us a copy of another letter received from Mr. E. Boehme, of Schweizer-Reineke, giving further particulars of the successful administration of Cyllin for bluetongue in sheep. Mr. Boehme says that those farmers who have been successful take from three to five teaspoonfuls of Cyllin to one bottle of water and give one tablespoonful of this mixture to each sick sheep. They also wash the sheep's mouth with this mixture to heal the fever blisters. Cyllin ought to be given immediately the sheep show signs of sickness, and if the sheep cannot graze on account of their sore mouths, mealie meal gruel should be given to keep up their strength until they commence feeding again. If this is not attended to, more sheep will die of hunger and weakness than of bluetongue. Attached is a

list of names of some farmers who used the Cyllin, and also of the number of sheep treated and died, which shows that out of 782 sheep only 38 died.

Name.	Farm.	No. of Sheep Sick.	Died.
R. Bohme.	Vechtvallei.	200	8
E. Bohme.	,,	180	15
L. A. Visagie.	New Castle.	100	2
Niels van der Merwe.	Italu.	174	1
A Nieuwenhoud.	Kareelaagte.	36	1
J. Lombard.	Hartebeestpan.	40	10
I. M. Putter.	Bethmansrust.	40	0
Abram de Lange.	Damplaats.	12	1

We must again add that in publishing these details we cannot vouch for them in any sense. The Veterinary Branch of the Agricultural Department has had no opportunity of testing the efficacy of this treatment, and therefore can offer no opinion one way or the other. The recognised veterinary treatment for this disease was fully stated in the May issue of this *Journal*.

Ant Extermination.

For the extirpation of ants the following remedies (states the *Queensland Agricultural Journal*) are good. To be effective they require attention and perseverance. It is well to find their main burrow or nest, if possible. Arsenic is sure destruction to them, but it is dangerous to handle.

Air-slaked lime plentifully dusted in warm dry weather over and around the hills, or in the house or other places infested, will cause the ants to vacate them in a short time.

Snuff.—Dust a little snuff upon the floor of the rooms or pantry.

Draw a thick chalk line around a smooth tree or across an upright board or post and they will not pass over it.

Camphor.—Put a piece of camphor, the size of a filbert nut, into 2 quarts of hot water. When cold apply to pot and other plants, and the insects will be driven off without injury to the plants.

Mix together 1 part of calomel and 10 parts of finely powdered white sugar, and lay it in little heaps about their nests and runs. The ants will eat it and die.

Coal oil, mixed with six times its bulk of water, sprinkled over the nests every few days, will kill and drive them away.

Pans or saucers, nearly filled with honey or sweet oil, attract ants, and they are drowned in it.

Flowers of sulphur, ½ lb.; potash, 4 oz. Set in an earthen vessel over the fire until dissolved and united. Afterwards beat to a powder. Infuse a little of the powder in water and sprinkle in places infested with ants.

To Destroy Black Ants.—A few leaves of green wormwood scattered among the haunts of black ants will drive them away.

Red Ants.—Powdered borax sprinkled around will exterminate both red and black ants.

Make holes in the ant hills, 6 inches deep and 1 foot apart, with an iron or zinc tube fitted with a wooden stake. Withdraw the stake. Pour 1 tablespoonful of bisulphide of carbon down the tube. Withdraw the tube and stop the hole immediately. Bisulphide of carbon is very inflammable.

To all this we can only add that in South Africa the one reliable destroyer is arsenic, but, as remarked above, it is dangerous to handle.

EPHEMERAL FEVER OR THREE DAYS' SICKNESS IN CATTLE.

By G. W. Freer, M.R.C.V.S.

The disease Ephemeral Fever, or "Three Days' Sickness," is one of the many plagues with which South Africa seems to be peculiarly cursed, but unlike many of the others, it has, fortunately for us all, caused no great mortality up to the present. The scientific term Ephemeral Fever, as well as the lay term "Three Days' Sickness," are both somewhat appropriate, as in the great majority of cases the disease quickly runs its course, and all acute symptoms have disappeared at the end of three days. The earliest report of this disease is that of Mr. Bevan, one of the Rhodesian Government Veterinary Surgeons. In an article contributed to the *Journal of Comparative Pathology*, he states that the disease first made its appearance amongst cattle in North-Western Rhodesia, and was investigated by Government Veterinary Surgeon Edmonds during the latter part of November, 1906. On the 7th of January, 1907, the disease appeared a few miles south of Buluwayo and from there it gradually spread until it reached the Transvaal and Natal, where outbreaks were officially notified during the last week in March. Mr. Bevan in his report makes mention that several of the old Matabele natives state that the disease has been in their country before, and a reliable native driver, who accompanied the pioneers to Rhodesia, stated that it existed in Khama's country about twenty-five years ago.

Some few weeks ago I obtained from the Uitenhage Library a book of travel called "The Heart of Africa," written by Dr. George Schweinfurth about the year 1867, in which he describes a disease among the native cattle of Central Africa, the symptoms being identical with those of "Three Days' Sickness." I am of the opinion that this is no new disease to the African Continent, but has been in existence for generations, and it is only on account of the country being now opened up to traffic that it has commenced to spread in new areas. With regard to outbreaks in this Colony, cases were reported in the Vryburg District by Government Veterinary Surgeon Simson during February, 1907, and a little later in the Transkei by Veterinary Surgeon Hutchence. The disease then slowly travelled down until at the end of 1907 outbreaks occurred in the Uitenhage and adjoining districts, where with intervals of quiescence it has remained ever since.

Cause, and Mode of Infection.

Ephemeral Fever is due to the entrance into the system of a specific organism, and can be transmitted to a healthy animal by inoculation with blood from a sick animal. Cattle of all breeds, and in all conditions, whether fed on sweet Veld or sour, Karoo or Coast Veld, are susceptible to this disease. I have noted that young calves seem to possess a greater resistance to natural infection, and fat, and stall-fed cattle usually show more acute symptoms than those in low condition. Mr. Robertson, the

Veterinary Bacteriologist, during the course of a series of experiments, found that cattle showed signs of sickness from two to three days after inoculation with virulent blood. We might reasonably conclude, therefore, that the period of incubation is from two to three days. He also found that one attack conferred an immunity for six weeks, and that the blood of a recovered animal did not produce the disease if bled when all the symptoms had subsided.

The transmission of the disease in nature is probably through the agency of night midges, in the same manner as Malarial Fever of sheep. This would account for the fact that cows, kept for long periods in yards in town entirely isolated from others, have contracted the disease.

So far transmission experiments conducted with ticks have failed.

Symptoms.

These in the majority of cases are so very marked that there is no great difficulty of diagnosis. The general appearance of a bovine suffering from an attack of "Three Days' Sickness" is very much like that of the wooden cow we obtained from the toy shop in our early youth. There is the same characteristic look of extreme helplessness, with the evident disinclination to move unless assisted. The principal symptom is stiffness of one or all of the extremities, and usually of the whole body. One peculiarity is that the stiffness may rapidly pass from one limb to the other. The earliest indications of an attack are loss of appetite and suspension of rumination, a rise of temperature with roughness of the coat, and a watery discharge from the eyes and nose. In a few hours these symptoms rapidly develop when the temperature may reach 106°F. Painful lameness appears in one or more limbs, or general stiffness of the whole body. The stiffness of the neck with more or less inability to swallow is very characteristic. The mucous membrane of the mouth becomes reddened, the eyelids swollen, and the eye glaring in appearance. The bowels may be relaxed, but in the majority of cases are constipated, the foeces being covered with strings of mucous. In cases where the sick animal lies down there is inability to rise, and when placed on its feet there is evidence of loss of power, and it quickly resumes the recumbent position. In about forty-eight hours the temperature falls nearly to normal, appetite returns, acute symptoms disappear, and in the greater percentage of cases the animal is convalescent at the end of three days. I have frequently seen cases where the symptoms have been so severe that one has felt doubtful as to whether the attack may not prove fatal, and find the patient on the following morning with no trace of disease, and feeding well.

In some instances complications may arise and the symptoms persist for two or three weeks. These cases are fortunately rare.

Post-mortem Appearances.

As the majority of deaths usually put down to "Three Days' Sicknes" are found on investigation to be due to other causes, one rarely finds a fatal case where the *post-mortem* symptoms are typical. The following are the most important. Enlargement of almost all of the lymphatic glands of the body, particularly those in front of the sternum or breastbone. They show areas of hæmorrhage, and are more juicy than normal. Slight reddening of the mucous membrane lining the fourth stomach and intestines, no other lesions are constant. These symptoms are taken from cattle suffering from a typical attack, and destroyed by Mr. Robertson, the Veterinary Bacteriologist, for the purpose of investigation.

Mortality.

The mortality from the disease itself has been almost nil. Numerous deaths have been reported, but in those cases where I have been able to make a *post-mortem* examination I have invariably found that the loss has been due to some complication. In those cases where the animals are suffering from stiffness of the neck, and owners persist in pouring down all kinds of noxious fluids, there is every probability that death will ensue from pneumonia. The unfortunate animal being unable to swallow properly, the fluids naturally gravitate down the trachea into the lungs. Deaths from Redwater and other like diseases have been frequently mistaken for Ephemeral Fever. It can be reasonably understood, that where there are several cases in the one herd the owner might think that each fresh case was due to the same cause, and in the majority of instances consider it unnecessary to inspect the animal. Since the introduction of Ephemeral Fever, there has been a considerable increase in the number of cases of Redwater, even on farms where cattle have been considered salted for some time. I am of the opinion that this is due to the attack of Ephemeral Fever so lowering the tone of the animal's system as to lose its resistance and so enable the Redwater parasites to gain the upper hand.

Immunity.

Veterinary Surgeon Bevan, in his report to the *Journal of Comparative Pathology* of June, 1907, stated that there is no record of an animal having suffered from a second attack of the disease. Although it has been my experience to find that in a large percentage of cases one attack does confer an immunity for a considerable time, still I know of numerous cases where cattle have had two and three attacks, and only a month ago I saw two cows, the owner of which assured me that they were suffering for the fourth time. In the majority of cases the second attack is worse than the first.

Treatment.

In this disease, the less the patient is interfered with the better will be the results. In the event of the bowels being very constipated, a dose of Epsom Salts would be beneficial, but I would advise great care being exercised in administering it, especially when the neck muscles are affected. I strongly recommend keeping the animal in a cool, shady place (if possible), attend to its general comfort, and leave the rest to Nature. From time to time numerous so-called remedies have been advocated as certain cures for this disease, but I am convinced that they are all equally worthless. Transport oxen should not be inspanned for at least a fortnight after recovery, as they are quite unfit for work before that time. Many farmers have found that out from very bitter experience. As the disease can be communicated by direct inoculation, Mr. Robertson, the Veterinary Bacteriologist, recommends this course to transport-riders who wish to get their spans through the disease, and have done with it. It is certainly better to have all the cattle affected at one time than to be worried with isolated cases for weeks, which probably keep the infection alive on the farm.

As far as preventive measures are concerned, none are known at present, but as the disease is carried by insect life, there is a possibility that some application can be found which will assist in keeping them off the animal, although the expense and trouble of applying it may be more than the pecuniary loss from the disease itself.

CALF DISEASES.

By W. ROBERTSON, M.R.C.V.S., F.R.S.E., Director Veterinary Laboratory, Grahamstown.

DIARRHŒA IN CALVES.

From conversation with farmers and stockowners in this neighbourhood, and from correspondence with the more distant, it would appear that Diarrhœa, of a contagious nature, has been very prevalent amongst young calves this past season, and that a large mortality has ensued, many farmers having lost 40 per cent. of their year's increase.

It must be definitely understood that Diarrhœa—or undue looseness of the bowels—may be a common result of some error in diet, or as a result of simple indigestion, and at first may be nothing more than an attempt of Nature to relieve the stomach and bowels of offensive and irritating contents, or may simply be the mechanical result of the eating of green forage.

But the form of Diarrhœa with which I wish to deal is known in Europe as "White Scour" (from the nature of the dung), which has been proved to be due to a definite micro-organism, and is contagious from calf to calf, and even hangs about the stables, and kraals, and which can be transferred from the sick to healthy animals by means of infested bedding, boots of attendants, water, etc. At one time this form of scour caused so much loss to calf breeders in the United Kingdom, and more particularly Ireland, that a Royal Commission, including the famous scientist "Nocard," was formed for its investigation.

The symptom of this Diarrhœa may appear so promptly after birth as to lead to the idea that the cause already existed in the body of the calf, and it usually shows itself before the end of the second week. It may be preceded by constipation, or by colicky pains as in acute indigestion.

The tail is stained by the liquid dung, which has a dirty white colour, and lumps of grey, greasy-looking material, which sticks to the boots, and has a most peculiar and disagreeable odour like that of rotten cheese. This grey matter is simply the undigested *casein* in the milk and gives the disease its European name of "*White Skit*" or "*White Scour.*" In acute cases death may occur from exhaustion in two or three days. When the case is prolonged the dung is at first yellow, then becomes dirty white; the calf generally retains its appetite, but as the disease increases in severity shows less and less disposition to suck, and has lost all life, lying almost continually, and staggering about when forced to move. Condition is lost rapidly, the hair stands on end, the coat becomes dry and scurfy, the nose is hot, and the animal presents a most wretched and miserable appearance, and the whole body exhales a most disagreeable odour. As the disease advances, the calf becomes unable to get up, straining is very great, and blood frequently appears in the dung.

Treatment.—As soon as a case is noticed, remove all the healthy calves away from the sick one, and keep them separate, have them attended by separate herds. Clean all the calves' surroundings, or better still, shift them to new "hocks" and remove all sick as they are noticed.

Treatment of the sick animals will vary according to the nature and stage of the disease, but the first thing is to remove the irritant matter from the bowels, and for this from one to four ounces of Castor Oil (according to the size of the calf) may be given. Great harm is often done by giving Opium and other astringents at this stage, these merely bind up the bowels, but as soon as their effect passes off, the Diarrhœa commences as bad as ever, because the irritant matter is still remaining in the bowel. (Bear in mind the old physician's axiom and motto, "*remove the cause and the effect will cease.*")

When the irritating materials have been removed in this way, then sedatives or bowel soothers can be given. I know nothing better than the following mixture:—

Chlorodyne	6 ounces.
Prepared Chalk	4 ounces.
Powdered Ginger	1 ounce.
Water to	24 ounces.

Dose.—From one to four tablespoonfuls, according to the size of the calf, once or twice a day.

If there is a considerable amount of blood in the dung, give two teaspoonfuls Nitrate of Bismuth in a half bottle of thin starch (made with warm water and when cold should be about the consistency of thick cream) every morning. This Bismuth can be given in conjunction with the chalk and opium mixture.

When there is much straining, and it looks as if the rectum or end gut were going to come out, try an injection, or enema of a pint of starch (made as above) and add to it some Laudanum, a tablespoonful to the pint, will be enough.

If this disease is noticed and attended to at once much can be done by treatment, but if neglected until the calf herd becomes well invaded, much loss may occur, both from the loss in condition and from the deaths.

Warts in Calves.

On some farms these growths are very common and disfigure the young cattle very much. They would appear to be infectious, and spread from one animal to another. These warts are skin tumours (real "Papillomata," as they are scientifically called) and consist of an overgrowth of the superficial layers of the skin, and they have been proved to be contagious from animal to animal as well as from animal to man.

These warts are not dangerous to life, but they diminish the value of the animal, and when abundant cause stunting in the growth. (See Fig. 1.)

Treatment.—Many substances are recommended for their removal. A mixture of Cooper's Dip and Fat being the most common, the value of which depends upon the caustic effects of the Arsenic in the Dip. Though frequently efficacious, this is somewhat of a dangerous application, its action being difficult to control, and I have seen cases where the arsenic did not stop work on the eradication of the wart, but had eaten large holes in the animal's flesh. I have advised the use of Corrosive Sublimate in Spirits of Wine or Dop, in the strength of, one part of the Sublimate to 500 Spirit. To start with, the warts should be twisted off as far as possible with the fingers; and if flat scraped with a blunt knife, or

piece of hoop-iron, and the solution freely applied with a piece of cloth or a stiff brush. This corrosive sublimate is colourless, odourless, and extremely poisonous, so great care should be used in stowing and handling it, otherwise some unfortunate native may imagine he has struck a treasure trove in the shape of a bottle of his much-loved Dop and kill himself as a result. A good plan is to put a few drops of any dip into the mixture and thus avoid such mistakes.

The application can be repeated as often as one wishes, but three or four times should cause the warts to stop growing and eventually to wither up and drop off.

Joint Ill in Calves.

Or Septic Inflammation of the Joints, occurs in young calves within the first month after birth, and is usually connected with inflammation or suppuration of the navel string. The microbes from the unhealthy

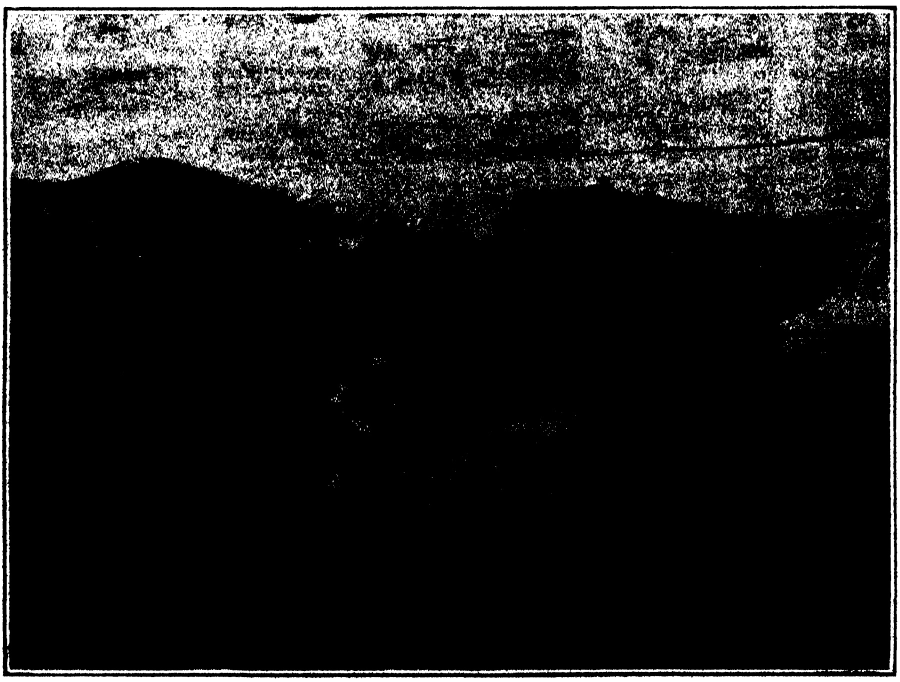


Fig. 1.—Warts on Calf's neck.

and infected navel string pass through the animal's system by the veins and form colonies, which result in abscesses, in and around the joints.

Symptoms.—Swelling of one or more joints, which are very hot, painful, and tender. The calf is stiff, lame, and lies persistently. There is high fever and general constitutional disturbance, the animal usually refusing to suck. Cases of this disease, if not attended to speedily, perish from weakness, pain, and exhaustion.

The cause, as before mentioned, is due to putrid matter, picked up from an infected navel string, getting into the system and lodging in the joints. Sometimes this disease presents itself as a perfect epidemic in some areas nearly every calf which is born in a certain season showing the symptoms; this is due to the stables, kraals, and sheds

with the disease germs, which then obtain an entrance to the fresh broken navel string, when the young animal lies on the ground, after the rupture of the membranes at birth.

If any cases of this disease are noticed it will be well to take precautions, and see to the proper tying and cleansing of the navel string as soon after birth as possible. Use a piece of thin string, dipped in a weak solution of Dip and Water, and tie the cord about half an inch from the animal's belly, a little Carbolic Ointment is as good a dressing as anything when the piece of navel and string sloughs off.

Curative treatment is not of much account. The navel should be cleaned and thoroughly disinfected with hot water and dip, and the swellings painted with Liniment of Iodine (not the Tincture, that is not strong enough). The calf should have a couple of ounces of Castor Oil and be lifted up to be fed.

Sponsziekte, or Quarter Evil.

Perhaps this disease (and more particularly this season) is the cause (and *preventable cause*) of more mortality amongst calves than all the rest put together.

Nature of the Disease.—In some features this disease resembles Anthrax, and for long it was looked upon as a manifestation of that disease. It is very widely spread, particularly in the Bush veld, and affecting mainly the bovine species, and for preference those between nine and eighteen months old, but in some districts where the disease is severe, cases in full-grown cows and oxen are fairly common.

Cause of the Disease.—Is a bacillus closely resembling that of Anthrax, and differing but little from it in size. It also possesses the power of forming within itself a spore or seed.

It is the presence of this spore, or seed, in the bacillus of Sponsziekte which makes the germ so long lived and difficult to kill. This bacillus resists disinfectants for a very long time, and Sponsziekte meat, dried into biltong can produce the disease after being kept for years (*I have personally done so with shreds of meat dried for nine years*). This fact may account for the occasional and mystifying outbreaks of Sponsziekte on certain farms after several years of freedom from the disease.

Symptoms of Sponsziekte.—The symptoms of this disease are both of a general and local character. The general symptoms are very much like those belonging to other acute infectious diseases. There is loss of appetite, stoppage of rumination, or chewing the cud, dullness, weakness, and high fever, the temperature running as high as 107° F. To these symptoms may be added lameness, or stiffness of one of the limbs due to the tumour or swelling which invariably accompanies the disease. The most important characteristic of this disease is the appearance of a tumour, or swelling under the skin of the affected animal. This swelling may occur in various places fore or hind, quarter, neck, or chest (I have seen cases occurring in the region of the throat which caused all the symptoms we generally get when a calf has a stick, piece of bone, or other foreign body in the throat). On pressure, a distinct crackling sensation is felt, due to the gas in the tumour passing to and fro in the spaces of the subcutaneous tissue. The tumour particularly when it occurs on a limb, or even a bone, may be mistaken for a fracture, and the complete prostration of the animal, and stiffness of the limb, tend to make this mistake the more likely.

This disease can be distinguished from Anthrax (independent of the presence of the swellings) by the fact that the blood coagulates well, and the spleen or milt is normal. If one of the Sponsziekte swellings is cut into, a quantity of gas with a peculiar odour will escape (Lactic Acid),

and the whole of the muscle, or meat, will be found to be spongy, and dark red in colour; the surrounding flesh may be, and generally is, quite healthy.

Carcases of animals dead from this disease should be burnt or buried; the latter will be the most convenient and general method of disposal. The native servants, dogs, etc., should not be allowed to even handle the carcase. Boys will not wash, or rather disinfect their hands and transfer some infection to the cow's udders, they milk, the calf sucks this in, and may be changing its teeth, thus affording the germ of Sponsziekte a ready entry to the body. It has been remarked above that the dried muscle or biltong of a Sponsziekte beast can produce the disease even after drying and keeping for a considerable time. Personally I find that salting, sundrying, and hand braying, will not destroy the infectious

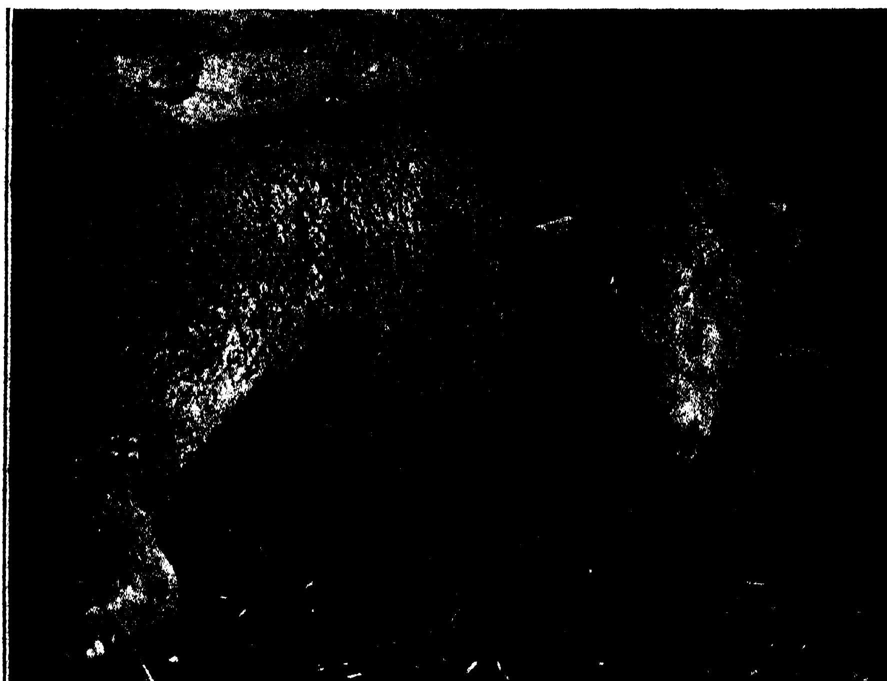


Fig. 2.—Sheep affected with Spons Ziekte in the hind quarter. Note the swollen leg.

nature of a skin from a Sponsziekte beast, that is, reims from a Sponsziekte hide, can produce the disease in clean cattle. Such being the case, the skins from cases of the disease must be buried with the carcase at least five feet deep, away from water, and so packed with stones that the jackal will let it rest in peace.

Treatment is not of very much avail, the disease being too rapid in its course. In the event of an opportunity occurring, I advise the incision of the swelling with a sharp knife and the free use of Carbolic and water in the strength of Carbolic one part, water 15 parts (it should be noted that a solution of this strength will burn and scald the fingers) and give doses of Carbolic internally, a calf will take half a teaspoonful twice daily in a bottle of milk, and a two-year-old, one teaspoonful in the same amount of milk. If Carbolic Acid is not available, give one of the *Carbolic Dips*, such as Little's or Cooper's (not the *Arsenical Powder*) Jeye's

or any of the others. In addition, hand-feed the sick animal. It must be carefully borne in mind that all this cutting of the swelling, etc., and subsequent treatment of the sick animal must be carried out *away* from all other calves otherwise we will infect our calf hock, shed or kraal, irretrievably, and in the event of a treated animal dying, the dung, litter, earth on which it has lain, etc., must be scraped up and buried with the carcase.

Preventive Inoculation.—Fortunately we have at our command a very excellent preventive inoculation for this disease, and one which should be employed by all owners of cattle, particularly in the Bush Veld. I advocate the yearly inoculation, about May, of the yearly crop of calves, just as the operation of ploughing and sowing are regarded as essential farming operations. The vaccine is cheap, the operation easy, mortality practically nil, and results most encouraging. The vaccine depends upon the facts that the virus of Sponsziekte can exist when dried, and powdered, and consists of strips of meat cut from the swelling met with in a case of the disease in a sheep (*i.e.*, a sheep is killed by inoculation of Sponsziekte and the meat from the resulting swelling used). This meat is slowly dried in a current of air in fly-proof rooms, and when quite dry, and hard, stowed away in jars. This dried meat is now finely powdered, divided into two lots and carefully heated, one lot to a temperature of 100°C. for five hours, the other lot to a temperature at 80°C. for five hours. Lot one is called *first vaccine*; lot two is called *second vaccine*, that is, lot one is nearer killed, and less likely to produce the disease than lot two. This powder is put up in tubes, each containing enough vaccine for ten head of cattle. The powder before use is dissolved in water, and injected under the skin, anywhere, followed at an interval of ten days by the second vaccine similarly used.

The details of the operation are as follows:—The operator provides himself with

A 10 c.c. Syringe divided into c.c.'s.

A wineglass or eggcup.

A small enamelled or tin pan.

A bottle of water which has been boiled and allowed to become cold.

The 10 c.c. syringe and needle, and the wineglass or eggcup are to be boiled in the pan and allowed to grow cool. The syringe is then filled (10 c.c.) with the water (which has been boiled and allowed to get cool) and the contents of a tube of first vaccine is shaken into the wineglass and then the 10 c.c. of water from the syringe squirted in, stir it with the needle and draw up the mixture into the syringe, if any vaccine is left behind squirt the mixture out of the syringe and again draw it up. The piston of a suitable syringe is marked in c.c.'s and on it is a travelling collar, so that the dose can be accurately guaged without fear of mistake. The needle is now inserted under the skin of an animal, the collar on the piston being so adjusted that only one c.c. can be driven out, the syringe is now fitted on the needle and the dose injected, and so on. The syringe must be gently shaken after every inoculation, particularly if it has been laid down filled with the vaccine mixture. With the powder vaccine, prepared at this laboratory, there is no danger of the needle clogging with fair usage, the vaccine being passed through a sieve three times smaller than the needle issued with the syringe. Full directions are issued with the vaccine, every lot being practically tested. The first vaccine is put up in a plain glass tube. The second vaccine in one with a *black ring*. It must be borne in mind that if the disease is amongst the

calves or cattle at the time of inoculation the mortality may not cease, *i.e.*, deaths may occur as late as ten days after the second inoculation. after that date immunity or "salting" occurs.

Another form of protective inoculation against Sponsziekte is by the use—instead of the powdered-up flesh—of threads soaked in the diseased material (treated as in the case of the powder) and introduced under the skin of the animal with a special needle (Fig. 3). This form of vaccine is called Blacklegine (a derivative of the English name for the disease Blackleg) and was much fancied before the powder form of vaccine was standardised for inoculation into any part of the animal. The early form of Sponsziekte vaccine its users will remember required to be introduced

Fig. 3.

under the skin of the animal's tail, this was a most difficult matter, particularly if the calf was in poor condition and the flesh under the skin very small in quantity, in many cases the skin adhered so close to the tail-bone that it was a matter of impossibility to introduce the dose of vaccine or prevent it running out when the syringe needle was withdrawn. This Blacklegine vaccine for a long time gave satisfaction, but recently users of it are losing faith in it, several outbreaks of Sponsziekte having occurred after its use or rather its use failed to stop the animals dying, and really I do not see where its advantage comes in when the powder form of vaccine prepared at the laboratory is so easily worked with and so safe.

THE MANURING OF FRUIT TREES AND VINES.

By I. TRIBOLET, Viticulturist and Orchardist, Elsenburg Agricultural College.

[The following paper orginally read before the Paarl Farmers Association is reprinted from the *Agricultural Journal* for Sept. 1906, No. 3, vol. xxix, by request of the Wellington Fruit Growers Association.]

Although a good deal of intelligence, study, and experimental work has been put into the manuring of nearly all the plants that man grows, either for his use or for his pleasure, this art has as yet not reached the point of an exact science, nor will it ever do so on account of the variation of the factors with which we have to deal. By chemical analysis you can find out almost exactly what your plants take out of the soil in coming to maturity and in bearing their crops. By the same means you can find out what your soil contains in the way of the requirements of these plants. If such is the case, one is inclined to ask: Why not add to your soil the exact amount of the constituents in which it is lacking, and obtain the maximum amount of return from those plants? This is the end to which all scientific manuring tends, but as I have already stated, there are one or two factors which prevent this end being attained with the mathematical precision that would enable us to designate the art or science of manuring as an exact science. One of the factors that prevents us reaching the desired end, is the varying physical nature of the soil; that means the size and arrangements of the grains of the soil; a sand may be fine or coarse, a clay smooth or gritty, a loam light or heavy, any of these characters may predominate, or they may be blended evenly throughout the whole mass. Another thing that prevents us is the mechanical condition of the soil, by which is meant either its natural condition, or that into which it may be brought by cultivation. These conditions of the soil have a great influence on the amount of plant food assimilated by vegetation even if it be present in an available form. Another thing is that the roots do not come in contact with all the plant food found in the soil, so that very often to get good results even more food has to be actually applied in the shape of manure than the plant uses altogether. Then there are the climatic factors: Heat, winds, rain, frosts, etc., over which we have little or no control, and which are hardly ever the same two seasons running.

In some countries the difficulties connected with manuring are less pronounced and more easily overcome than in others, for instance in the wheat growing areas of Australia it has been found from experiment and chemical analysis that the land contains abundance of nitrogen, potash, and lime. All that is at present required to get the maximum return of wheat from these soils is to give them a dressing of from 70 to 100 lbs. per acre of superphosphate or phosphatic manure that will add 12 to 15 lbs. of phosphoric acid to that area. This remark practically applies to fruit trees and vines in those parts.

Here we have different and more difficult conditions obtaining on account of the more broken nature of the country and the infinitely more varied chemical composition, character, and consistency of our soils. The problem is thus far more complex. Most of you know from experience that the manure giving excellent results in some classes of your soil does not give such good results in others; as Mr. Jack truly said in his last lecture "formulae and recipes for manuring are almost out of the question in this country," To me there seems no way of these problems being finally solved but by each farmer experimenting on his own plantation. First getting it into such a condition of tilth that any manures or fertilizers he applies may have a chance of producing the best possible effect, keeping an exact record of the results obtained, adding a little more of this and a little more of that till he gets the maximum result from the minimum of cost.

After these few general remarks I will now treat more directly on the subject in hand, viz.:—"The manuring of fruit trees and vines."

They, like other plants, depend for their growth upon different food constituents found in the soil and in the atmosphere, the principal of which are nitrogen, phosphoric acid, potash, lime, iron, soda, magnesia, and a few others; of this list we need only take into consideration the first three or at the most four, viz.:—Nitrogen, phosphoric acid, potash, and lime, the rest are invariably found in the soil in sufficient quantities. It might be interesting and perhaps useful to give here the tabulated results of a series of experiments made last year in America of the total amount of different plant food constituents used in one season by the growth of fruit, foliage and new wood on one acre of bearing trees, the amount of plant food used by the tree branches and roots in increasing their size is not included in these results.

AMOUNT OF PLANT FOOD USED PER ACRE.

Variety of Trees.	Nitrogen.	Phos. Acid.	Potash.	Lime.
	Lbs.	Lbs.	Lbs.	Lbs.
Apple	51·5	14·0	55·0	57
Peach	74·5	18·0	72·0	114
Pear	29·5	7·0	33·0	38
Plum	29·5	8·5	38·0	41
Quince	45·5	15·5	35·0	65
Vines	20·0	12·0	36·0	—
Oranges (fruit alone)	53·8	13·4	55·6	—
Apricots (estimated)...	70	12·0	60	100

It will be seen from this table that the Peach tree takes more out of the ground than any of the others, next comes the Quince, then the Orange. These American figures may be somewhat high for this Colony, as the crop of fruit upon which they are based is a good deal above the average here. I should reckon about a quarter off. The vines are calculated for a two and half leaguer crop. Nitrogen and potash in the case of each kind of tree come nearest in quantity, whilst Phosphoric acid bears a relation of between a third and a fourth to these constituents. The amount of lime in most cases approaches the potash.

Most granitic soils especially when of a clayey nature are deficient in phosphoric acid and lime, and although lime may be in the soil in sufficient quantity for the actual food required by the plant, a dressing of this material now and then tends to sweeten the soil, liberate the potash, and make available the organic matter locked up in the soil. Applications are especially beneficial when farm-yard manure has been used for several years in succession or in alluvial soils rich in organic matter. Light soils are as

a rule not so much benefited by the application of lime. Lime is particularly important in some fruits, it strengthens the stem and woody portions of the tree, shortens the period of growth and hastens ripening. In the application of manures to fruit trees and vines, although they use a lot of nitrogen, it is generally given in excess and has a tendency towards over production of wood and foliage causing a late season and badly coloured fruit. The amount of growth trees make and the colour and length of time the foliage remains on, are good indications as to whether the orchard or vineyard requires a dressing of this manure. The application of nitrogen often does more harm than good. When trees appear to be lacking nitrogen it is often tillage and moisture they require rather than nitrogen. Besides this is one of the most expensive manures, costing at present 18s. per unit of 20 lbs. or £14 8s. per ton in the shape of nitrate of soda. So that where possible I should advise green manuring with leguminous plants such as peas, beans, vetches, clovers, etc., wherever nitrogen is required. These plants, as you no doubt know, have the power of abstracting nitrogen from the atmosphere, and fixing it through the instrumentality of the little nodules found on their roots. A crop of the plants mentioned sown in the autumm or early winter and ploughed down in spring when in bloom, will not only give you sufficient nitrogen, but also add humus—"That intimate mixture of organic and inorganic matter that absorbs and retains fertilising elements and modifies the chemical and physical properties of soils, so that it absorbs moisture more readily and retains it longer,"—causing improvement to your lands.

The cow-pea is the quickest in its manurial effects of any green manuring, and about blooming time will give you, with, say, a two-ton crop to the acre:—

Nitrogen	25 lbs.
Phosphoric acid	4 ,,
Potash	14 ,,

Vetch gives:—

Nitrogen	26 lbs.
Phosphoric acid	6 ,,
Potash	10 ,,

Field Pea gives:—

Nitrogen	18 lbs.
Phosphoric acid	4 ,,
Potash	14 ,,

This is in round figures and allowing a crop of two tons of each to the acre.

Potash.

One of the leading factors in fruit trees and vine manuring is the application of Potash. Although our soils especially the vleis contain a higher percentage of potash than they do of the other inorganic plant foods, it is very often found in a form that cannot very readily be assimilated by plants. Green manuring combined with good tillage would open up the soil and help to render a larger percentage of this material available. Still it is advisable that more be added by an application of potassic manures such as sulphate of potash, kainit, etc., or by any of the complete fertilizers such as guano, kraal, stable, or kraal ash.
can be applied in the form of superphosphate or basic slag, and is contained in certain proportions in any complete manure. It is one of those foods that greatly influence the formation of seeds in pome fruits and kernels in stone fruits. Since manuring has been placed on a scientific basis, more attention has been given to the application of this plant food

PHOSPHORIC ACID

than hitherto, and it is generally considered, especially in vine manures, that the proportion of phosphoric acid in relation to nitrogen has not been sufficient. Coste Floret, who has carried on experiments in the matter of manuring vines for over eighteen years, says in reference to this point:—"That the main benefits derived from phosphatic manures on vines are: 1st. They cause the fruit to set better at flowering time. Non-setting is frequently due to want of phosphorus, the great regulator and basis of seed nutrition. The seed is the fruit of the vine, the object for which nature provides the berry. 2nd. They increase the percentage of sugar in the juice, and thus in many cases the quality of the wine. Choice wines are much richer in phosphorus than common ones. 3rd. They hasten the maturity of the fruit. 4th. They regulate fermentation, thus enabling a better and sounder wine to be made. 5th. They cause the wood of the vine to be more robust and to ripen earlier, thus supplying better pruning wood as a start for the following season. 6th. They render the vine much more resistant to fungus diseases. Nitrogen tends to increase those diseases. The vine is freer from all diseases in soils well equipped in phosphatic manures." He considers that more phosphoric acid than the vine requires should be supplied, as it absorbs nitrogen and lime greedily, and takes up potash readily, but phosphoric acid only with difficulty. He prefers manuring little and often, and finds that it is better to supply a complete manure every year instead of large quantities of other manures at longer intervals, and that the quantity of phosphoric acid should be at least double that of nitrogen irrespective of the quantity of nitrogen adopted as a basis for the manure. Other authorities show that in whatever way phosphoric acid is applied, only about half the quantity is assimilated by the vine.

In 1903 and 1904 experiments were carried out by Mr. Mayer, one of our late Government Viticulturists, in the manuring of vines at Stellenbosch, Wellington, and Groot Constantia. On Mr. Cillie's farm, Wellington, vines treated with 1 oz. nitrate of soda, and 4 oz. of basic slag to each vine gave an increased return in two years' treatment at the rate of 6,732 lbs. of grapes per morgen for the two seasons, taking 3,600 vines to the morgen. 1 oz. of nitrate of soda and 4 oz. of superphosphate gave an increased return in two years of 5,920 lbs. of grapes per morgen. 1 oz. of nitrate of soda, 2 oz. of superphosphate and 4 oz. of kraal ash gave an increase of 4,932 lbs. 1 oz. of nitrate of soda and 2 oz. of superphosphate without kraal ash gave an increase of 1,440 lbs., about 3,000 lbs. less than with the kraal ash, which contained 12 per cent. potash. A number of plots were tried at each place mentioned, and the combination of 1 oz. of nitrate of soda with about 4 oz. of phosphatic manures—either superphosphate or basic slag—gave the best results, On Mr. Havers's farm, on the plots manured with 1 oz. nitrate of soda, 2 oz. superphosphate and 4 oz. kraal ash, the increased returns were highest, being 5,976 lbs. for the two years. 2 oz. of Government guano per vine on this farm gave an increase of 2,376 lbs., whereas on Mr. Louw's farm the same dressing gave an increase of only 601 lbs. These experiments as far as they go are interesting, and go to show that phosphatic manures are beneficial with a small quantity of nitrogen. Nitrogen was tried alone on each farm, but gave but poor results. Superphosphate or basic slag was not tried alone. The experiments also point to the fact that what does best on one farm does not always do so well on another. The value of the experiments was to an extent nullified through some of the vines having the year before been manured with farmyard manure in one instance and with basic slag in another. So far as I know these are the only data we have of experiments in the manuring of vines in this Colony.

I should say that experiments of this nature would be of great value to the wine and fruit farmer, either carried out by the Government or by Associations such as ours, or by the individual, no matter by whom, so long as they were done with accuracy for a number of years and in different districts, correct record kept of condition, nature and composition of soils, exact amount and kinds of manures used, how and when applied, returns accurately weighed or measured, and the whole of the operations and results tabulated from year to year and the information distributed broadcast among those interested in the industries. Thus in a few years' time we should have a fund of accurate local data to hand and something reliable to work on, without depending on other countries for information which, however useful it may be, is obtained under conditions of climate and soil, at any rate not quite identical with our own

Application of Manures.

The manner of applying manure to trees and vines depends a good deal on the condition and class of the manure you are putting on. Farmyard manure may be well made and thoroughly rotted, or it may still contain a lot of half-decayed bush, vine cuttings, vlei grass, etc. This manure is generally put on in three different ways: 1st, in holes between or at the side of your vines; 2nd, in trenches dug in every or in alternate rows; 3rd, ploughed in fairly deep in every or in alternate rows. Of these systems the hole one is the most objectionable, on account of the manure being confined to one spot, and only coming in contact with one portion of the root system of the vine, the young rootlets when they find their way to such a mass of manure when it is fresh and strong may be seriously injured by it. I would prefer the trench system to the hole, and the ploughing in with three or four furrows to either. The more the manure is spread over and worked into the ground, the better chance the roots have of getting the full benefit of the application. Stable or farmyard manure should be applied if possible in the autumn or early winter, so as to get the whole of the season's rains. One of the great advantages of farmyard manure over artificial is the amount of organic matter it adds to the soil and the extent to which it improves the ground physically. The material put in kraals when animals are kept for the purpose of increasing the manure supply of the farm has an influence on the quality of the product. Vine cuttings, brush, pine needles, etc., each add slightly different proportions of ingredients in the make-up of the manure. In the matter of pine needles, etc., heavy dressings of manure, say, 20 tons to the acre, when they are largely used in the kraals, may have a bad effect on plant growth through it being attacked by the acids and resins the pine contains, but when used in moderation no ill effects need be feared. Where vines are absolutely free from disease, a good deal of the plant food might be returned to the soil by the prunings being ground up and ploughed in. The fresh burned ash of the cuttings forms a valuable manure—it contains 37 lbs. phosphoric acid, 75 lbs. of potash, 226 lbs. of lime to the ton. The exact value of kraal manure as obtained from our drier districts is hardly yet known, but it is undoubtedly very rich in plant foods, and, supplemented with some of our artificial manures to make up the proportion of those constituents in which it is lacking, will, I think, make one of our most valuable fertilisers for trees and vines. Mr. Blackshaw, Agricultural Chemist at Elsenburg, has made an analysis of kraal manure as landed here in trucks—with his permission I have appended the result of his analysis to this paper.

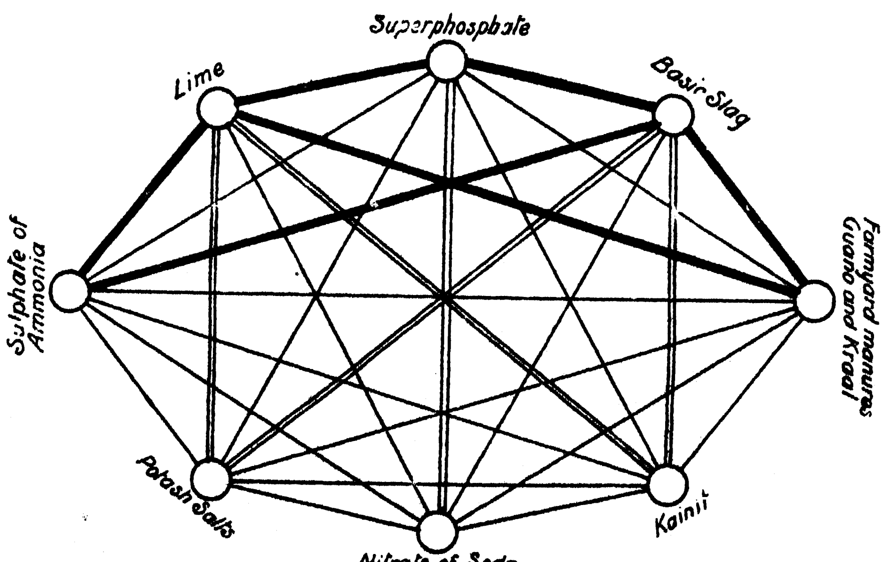
The matter of applying artificial manures is far simpler, as most of them are in a finely-divided state, and can be sown broadcast in the vineyard and in the orchard if the trees are big and the roots occupy practically the whole of the ground. It may be worked in by either plough,

cultivator, or harrow. If the trees are young and small, the manure should be confined in circles round the tree, say, from six to eight feet, according to the size of the tree. As a rule slowly soluble manures, such as bone meal, bone dust, ground bones, basic slag, etc., should be applied to the soil some time before they are actually required for the plant's use, about the same time as you would apply farmyard manure. They thus have a chance of being acted upon by the acids contained in the water present in the soil, and are rendered available for the plant's use slowly. Soluble manures, such as superphosphate, sulphate of ammonia, nitrate of soda, sulphate of potash, and the like, should be applied later, when the tree begins to show signs of vegetation, but not later than the flowering time, for the wood growth then would be liable to be forced on at the expense of the fruit crop. It is a good plan to put it on in two or three doses at short intervals—harrowing it in is quite sufficient if the soil is in good tilth.

It is better to manure consistently and in moderation every year than to give a heavy dressing one year and then to miss a year or two before giving another. It is also almost worse to give highly stimulating manures alone than to give none at all. They should be combined with slower acting ones, so that the tree or vine when forced into excessive growth will have something to fall back and feed on.

MIXING FERTILIZERS.

A few words might be said about this, as sometimes manures of different sorts are mixed to the detriment of either one or more in the mixture. A practical manner of illustrating which fertilisers should and which should not be mixed together is prepared by Dr. Geekens, of Germany, and given below:—



Substances connected by the thick line must not be mixed. Substances connected by double lines must only be mixed immediately before use. Substances connected by single thin line may be mixed at any time. Thus sulphate of ammonia should never be mixed with lime or any manure containing lime such as basic slag or wood ashes. Lime drives off the

ammonia, and thereby lowers the quality of the fertilizer. Superphosphates should not have lime in any form added to them, nor should superphosphate and Thomas phosphate (basic slag) be mixed, on account of the lime present in the latter. Bone dust and superphosphate may be mixed without danger.

Lime should always be sown in the early winter and harrowed in rather than ploughed in.

Never sow either seed or phosphatic manures within at least a month of sowing lime.

As I have already pointed out, when soils vary so much as they do here, both in composition and physical texture, to slavishly follow manurial formulæ would in a great many cases be putting valuable ingredients into soil where from the point of view of getting a return they would be absolutely thrown away.

It is no use applying nitrogenous manures when your orchards and vineyards are making abundance of foliage and new wood, or a heavy dressing of phosphoric acid or potash if your plants have as much of these materials as they can use. Analysis and experiment assist us in finding out what is required. It has been practically established that Potash is one of the most beneficial ingredients that can be applied to fruit trees, phosphoric acid and nitrogen not being quite so important. Again, a great deal depends on what is already in your soil. Although manuring is a very important matter, it must not come before tillage. Undrained, sour, badly cultivated soil is very little benefited by any manures you may put on.

Although some of you may be acquainted with the composition of the most commonly used manures, a few formulæ and a list giving the percentages of the ingredients they contain may not be out of place.

Basic Slag (Thomas' Phosphate) contains:—				
	17	per cent., Phosphoric Acid or	340	lbs. per ton.
Superphosphates:	17	per cent., Phosphoric Acid or	340	,, ,,
Nitrate of Soda:	16	per cent., Nitrogen	320	,, ,,
Sulphate of Potash	50	per cent., Potash	1,000	,, ,,
Bone Dust:	3·5	per cent., Nitrogen	70	,, ,,
	25	per cent., Phosphoric Acid	500	,, ,,
Dissolved Bone:	3	per cent., Nitrogen	60	,, ,,
	16	per cent., Phosphoric Acid	320	,, ,,

Government Guano (Average of 50 Samples).

11·25	per cent., Nitrogen	or	225 lbs. per ton
12·94	per cent., Phosphoric Acid		258 ,, ,,
4·03	per cent., Potash	...	80 ,, ,,
12·5	per cent., Lime	...	250 ,, ,,

Government Guano (Analysed at Elsenburg).

13·3	per cent., Nitrogen	or	266 lbs. per ton.
8·4	per cent., Phosphoric Acid		168 ,, ,,
2·76	per cent., Potash	...	55 ,, ,,

Fresh Horse Manure (Department).

·59	Nitrogen	... ...	12 lbs. per ton.
·36	Phosphoric Acid	...	7 ,, ,,
·49	Potash	... ...	10 ,, ,,
·36	Lime	... ...	7 ,, ,,

Mixed Stable Manure.

·50	Nitrogen	10 lbs. per ton.
·26	Phosphoric Acid ...	6 ,, ,,
·63	Potash	13 ,, ,,
·70	Lime	14 ,, ,,

Mixed Farmyard (Elsenburg exposed during Summer, Samples taken in June, 1906).

·71	Nitrogen	14 lbs. per ton.
·65	Phosphoric Acid ...	13 ,, ,,
·84	Potash	17 ,, ,,

Sheep Manure.

1·54	per cent., Nitrogen ...	31 lbs., per ton.
·89	per cent., Phosphoric Acid	18 ,, ,,
2·20	per cent., Potash ...	44 ,, ,,
7·59	per cent., Lime ...	150 ,, .

Cattle Manure.

·48	Nitrogen	10 lbs. per ton.
·14	Phosphoric Acid ...	3 ,, ,,
·64	Potash	13 ,, ,,
·48	Lime	10 ,, ,,

Sheep Kraal Manure (Uitkijk, Beaufort West)

·98	Nitrogen	20 lbs. per ton.
·87	Phosphoric Acid ...	17 ,, ,,
2·62	Potash	52 ,, ,,

Sheep Kraal Ash (Departments)

12·3	Potash	246 lbs. per ton.
1·8	Phosphoric Acid	37 ,, ,,

Ash of Vine Prunings.

11·34	Lime	227 lbs. per ton.
1·85	Phosphoric Acid	37 ,, ,,
3·76	Potash	75 ,, ,,

Samples of guano, sheep, horse, and kraal manures vary a good deal in their composition.

A good general manuring on fair soil for stone fruits would be:—

250	lbs. Government Guano.
300	,, Basic Slag.
150	,, Sulphate of Potash.
700	

Taking 100 trees to the acre it should be applied at the rate of 7 lbs. to the full-grown tree.

This would give you about 30 lbs. nitrogen, 60 lbs. phosphopic acid and 75 lbs. potash to the acre.

Practically the same amounts would be supplied by giving your trees.

	3,000 lbs.	Sheep Kraal Manure.
	350 ,,	Basic Slag.
	3,350.	
or	550 lbs.	Sheep Kraal Ash.
	250 ,,	Government Guano.
	100 ,,	Basic Slag.
	900	

For Apples and Pears.

120 lbs.	Government Guano.
500 ,,	Basic Slag.
180 ,,	Sulphate Potash.
800	

This gives you about 14 lbs. nitrogen, 93 lbs. phosphoric acid, and 93 lbs. potash to the acre, 6 to 8 lbs. to be given to each tree according to size.

or	1,000 lbs.	Sheep Kraal Manure.
	650 ,,	Ash.
	450 ,,	Basic Slag or Superphosphate.
	2,100	

For Citrus Trees.

100 lbs.	Government Guano.
500 ,,	Basic Slag.
220 ,,	Sulphate Potash.
820	

Gives about 12 lbs. nitrogen, 96 lbs. phosphoric acid and 110 lbs. potash. Give from 4 to 8 lbs. to each tree.

For Vines.

100 lbs.	Government Guano.
300 ,,	Basic Slag.
120 ,,	Sulphate of Potash.
30 ,,	Nitrate Soda.
550 lbs.	per 1,000 sticks.

Gives about 18 lbs. nitrogen, 60 lbs. phosphoric acid, and 62 lbs. potash. If soil lacks lime sow up to 500 lbs. per 1,000 sticks.

Other formulae may be made giving about the same proportions of plant-food or varied to suit local conditions. Should nitrogen not be sufficient, dressings of sulphate of ammonia or nitrate of soda may be given at the rate of about 1 to 1½ lbs. per tree, and 20 to 30 lbs. per 1,000 for vines.

AGRICULTURAL ZOOLOGY FOR SOUTH AFRICAN STUDENTS.

BEING A COURSE OF LECTURES ON AGRICULTURAL ZOOLOGY, DELIVERED BY DR. J. D. F. GILCHRIST, PROFESSOR OF ZOOLOGY AT THE SOUTH AFRICAN COLLEGE, IN CONNECTION WITH THE TECHNICAL EVENING CLASSES INAUGURATED BY THE SCHOOL BOARD OF THE CAPE DIVISION.

(Continued from Page 64.)

PROTOZOA, OR MINUTE SIMPLE ANIMALS.

The Protozoa are the simplest known animals. They consist of small masses of protoplasm or cells, each provided with one or more nuclei. Each cell performs all the animal functions independently; thus they never form large organisms composed of closely co-operating cells, nor are they differentiated among themselves to perform different functions such as we generally find in the animal body. Some forms of the Protozoa, however, show an approach to the Metazoa or multicellular animals; thus a number of them exhibit a certain amount of temporary or permanent co-operation in the form of comparatively large masses, though such masses are never in the form of the two layers so characteristic of the higher types; again some show a differentiation into cells which are not essentially different from the sperms and eggs of higher types, though never giving rise to complex organisms.

AMOEBA (Fig. 6) may serve as a type, though it is not the simplest, to illustrate the main features of these forms of life. The animal is minute, and should be looked for with the aid of a microscope. It may be found in most pools of water, on the ooze on submerged objects or in the mud at the bottom. It resembles generally a small mass of jelly-like substance, which consists of an inner granular part or *endoplasm* and an outer clear, more transparent part, the *ectoplasm*, which does not, however, form a distinctly differentiated or denser outer layer or skin as in some other forms of the Protozoa. If watched carefully it will be seen to move along slowly, thrusting out and retracting finger-like processes or *pseudopodia*. It is sensitive to stimuli of various kinds whether mechanical or chemical. It may be seen making towards a piece of vegetable matter, as for instance a diatom, and gradually enveloping it along with a small quantity of water. Other similar particles may be seen in the substance of the animal, each in its little cavity or *food vacuole*. The animal is, therefore, capable of searching for food and of taking it in, though by no definite mouth. The food becomes digested and absorbed into the substance of the protoplasm

while the non-digestible part may be passed out at any point. Respiration consists in absorbing oxygen from the surrounding water and giving off carbonic acid gas as a waste product. The other waste products seem to collect in a space, the *contractile vacuole*, which may be seen to grow gradually bigger until it bursts or opens, discharging its contents at the surface. A clear spot may be seen in the protoplasm. This is the *nucleus* which plays an important part in reproduction—a very simple process in Amoeba, though doubtless much more complex than we imagine. The animal, when it grows to a certain size, simply divides into two. This division has been preceded by a division of the nucleus into two, so that we have now two typical Amoebae in place of one. This process of *fission* apparently can be repeated indefinitely, so that under favourable conditions an immense number of individuals may appear in a very short

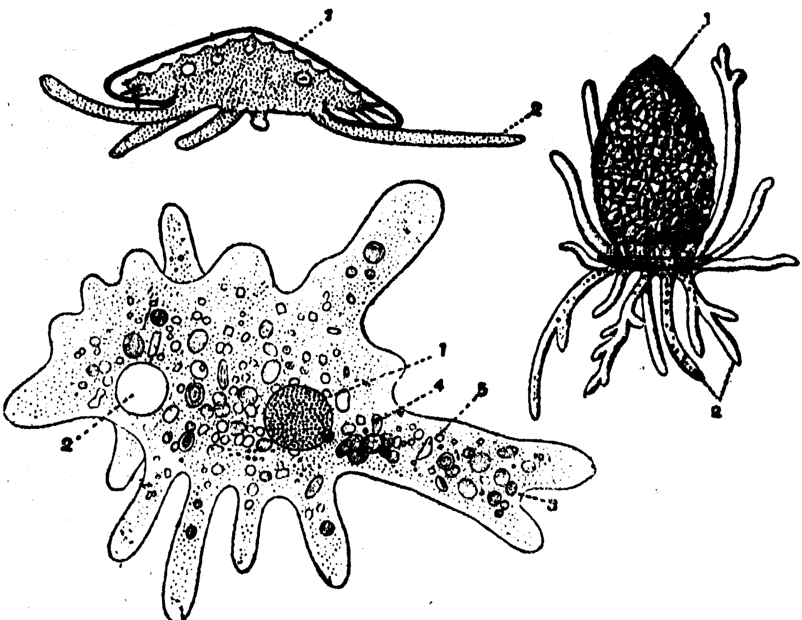


Fig. 6.—The two upper figures are: *Arcella* (on the left) with chitinous shell (1) and pseudopodia (2); *Difflugia* (on the right) with covering of sand grains (1) and pseudopodia (2) (after Leidy). The lower figure is *Amoeba*, ×330, with nucleus (1), contractile vacuole (2), pseudopodia (3), food vacuocles (4), and a grain of sand (5). (Shipley and McBride after Gruber.)

time, a feature in these animals that make them, as we shall see, one of the most important factors in animal life generally, so that these feeble and defenceless organisms can hold their own in the perpetual warfare between the varied forms of life. The Amoeba is not, however, quite defenceless. It may at times become surrounded by a tough spherical wall or cyst apparently of a chitinous character (not of cellulose, as in plants and some other Protozoa), and in this condition of *encystation* it can safely tide over periods of unfavourable surroundings, such as occur in excessive cold or dryness. On the recurrence of favourable conditions the cyst bursts and the animal crawls out to renew its usual mode of life. Sometimes also it has been observed that the Amoeba has not been entirely torpid, but has divided up into a number of smaller parts or *spores*, and these escape to form new Amoebae.

The process of increase by simple fission appears to go on indefinitely in the Protozoa, so that there would be no such thing as old age and death in these animals; there is evidence to indicate, however, that this is not so, and that a process of *conjugation* of two individuals is necessary for the continued life of the animal. The process has been observed in the Amoeba, but is better known in some of the other members of the group, as we shall see.

In the Protozoa there are therefore performed all the essential functions of living substance: assimilation, growth, reproduction, movement, and response to stimuli, and it is probable that it is to the study of these rather than the tracing out of probable lines of descent of higher animals that we may hope to arrive at a knowledge of the essential factors of animal life, bearing in mind, however, that living substance is not to be understood by a study of mere reaction to external elements, but that a series of complex unknown processes occurs within the protoplasm itself.

The Protozoa are usually classified according to their external form, but this varies so much, even in the same individual at different periods of growth, that the predominant phase only has to be considered. Again, certain features, as for instance whether or nót they have a definite outer layer, or whether they have a complex nuclear arrangement, may be taken as a key to classification. A number of forms may, however, be grouped around Amoeba, all characterised generally by the possession of more or less indefinite and changing processes of the protoplasm. These are called the RHIZOPODA. Another group shows specialised and definite organs in the shape of a few long whip-like processes or flagella (MASTIGOPHORA or FLAGELLATA), or many minute cilia (CILIATA). A fourth group is characterised by certain features which are the result of a parasitic habit, and is known as the SPOROZOA. There are certain forms which seem to be of a primitive type and may be mentioned, as they can readily be seen and are of interest, as the same individuals are sometimes amoeboid and sometimes have definite processes. They are illustrated by the so-called "flower of tan," *e.g.*, Fuligo. This occurs in large masses in damp places on vegetable substances, such as dead leaves, or on bark in the tan-yard. They are in reality composed of fused individuals which after a time become encased in little capsules, from which they escape as free and independent cells, often at first with definite locomotory projections in the form of flagella, subsequently changing into amoeboid forms, when they again come together and fuse into the "flower of tan" form. They are undoubtedly a primitive form, perhaps the most primitive, of the Protozoa. They are known as the MYCETOZOA.

Class I.—Rhizopoda.

In addition to Amoeba there are other forms with blunt lobe-like pseudopodia, but having the body partly protected by grains of sand as in DIFFLUGIA (Fig. 6), or a more elaborate shell as in ARCELLA (Fig. 6), which has lately been found to produce on division small and large forms which conjugate to form zygotes. These forms with lobate pseudopodia have been called the LOBOSA.

Again there is a group differing fróm these in having the pseudopodia in the shape of a fine network or threads. The FORAMINIFÉRA are examples of these. They may possess a calcareous covering with foramina or apertures through which the pseudopodia can be projected. GLOBIGERINA, the shells of which often occur as a thick ooze at the bottom of the sea or as chalk, and NUMMULITES, whose shells form the nummulitic limestone of which the pyramids are built, may be mentioned as illustrative of this group. Other foraminifera, such as BOTELLINA, from the Cape seas, are covered with grains of sand.

In the **RADIOLARIA** there are pseudopodia which project from the body in a radiating manner. There is usually a skeleton of silica, and there is also a central capsule which may contain one or more nuclei. The silicious shells of the dead animals often accumulate at the bottom of the sea and form a thick "radiolarian ooze." A type of this group is ACTINOSPHAERIUM.

Another group, the **HELIOZOA**, as typified by ACTINOPHRYS, have radiating pseudopodia but no central capsule dividing up the body into a central and outside portion as in the previous group.

In all these forms of Rhizopoda there is thus an increasing differentiation of the protoplasm with formation of a shell or skeleton often of very complicated structure, but there is no very definite form of body nor organs, the whole animal consisting of a mass of varying shape without definite structural boundary and with changing processes. Some of these forms, however, show an approach to greater specialization, and we may pass insensibly to forms of definite and permanent shape with an outer layer or skin, differentiated into a firmer cortical or outer layer with generally a cuticle or investing membrane, and with definite and specialized projections of the protoplasm, in the shape of long whip-like processes (flagella) or many short hair-like processes (cilia). As we might expect also there is usually a definite spot or aperture where the food is taken in, and we might call this the mouth, though we must always bear in mind that the "mouth" of higher animals is a structure entirely different, though physiologically or with reference to their function the two organs are comparable. This distinction may be noted here at the outset, as it is one which has often to be made in Zoology, and is expressed by saying that organs whose origin and structure are similar are "homologous," while those which resemble each other in the work they perform or physiologically are "analogous."

Class II.—Flagellata.

Of these forms provided with a definite outer layer of protoplasm and flagella, a common example is EUGLENA (Fig. 7). It is a small, almost microscopic animal, but when it occurs in quantity, as in pools or puddles of rainwater, it is visible as a greenish tinge when held up to the light. The body is elongate with a blunter anterior end, from which a long *flagellum* projects forward. By means of the vibration of this, the animal can swim, and it is also able to move by a peculiar contraction and twisting of the body (*euglenoid movement*). The body is covered by a delicate *cuticle* which is often finely striated. The green colour is due to *chlorophyll* by means of which it can feed like a plant. But it also has a mouth by which it may take solid food like an animal. The *mouth* leads into a short *gullet* from the bottom of which the flagellum starts. A *nucleus* occurs in the centre of the body and contains a smaller one or *nucleolus* within it. It has also a *contractile vacuole* with a non-contractile *reservoir* attached to it. A bright red speck, the *pigment spot*, looks like an eye, but probably is not sensitive to light as it consists of *haemochrome* a substance allied to chlorophyll. The resemblance to plants is also indicated by the presence of grains of peramylum, a substance allied to starch, and the animal may become *encysted* in a capsule of cellulose, also a characteristic vegetable product. While encysted the animal may become divided into two or more parts, each of which may become an ordinary Euglena on the rupture of the capsule. The type is of interest as showing how near we are yet to plant life in this group, though the mouth gullet and definite form is a great advance on Amoeba.

HETEROMITA (Fig. 7). is a form of the Flagellata illustrating degeneration or simplification of an organism brought about by an easy mode of life, while at the same time it shows a greater specialisation for reproductive purposes, exhibiting undoubted indications of an approach to the sexual process. The animal may be found in decomposing animal or vegetable matter in water. It has *two flagella*, one at the pointed end of the body and one a short distance behind. There is a *nucleus* and a *contractile vacuole*, but no cuticle nor chlorophyll as in Euglena. There is no mouth, and it obtains nourishment by absorbing dissolved animal or vegetable substances in the solution. (Such a method of feeding is known as "saprophytic," feeding on living animal or vegetable tissue being known as "parasitic.") Reproduction may take place by simple fission, as in Amoeba, but at times two individuals, not externally different, approach each other and fuse together, resulting in an irregular body with four flagella. This swims about freely for a time and finally assumes a triangular form with the flagella at two corners. Meanwhile internal changes have taken place which are not yet, however, well known. The protoplasm becomes quite clear, even the two nuclei which had fused disappearing. Finally the flagella are lost and only a three-cornered sac full of clear protoplasm remains. The contents then divide up into innumerable small

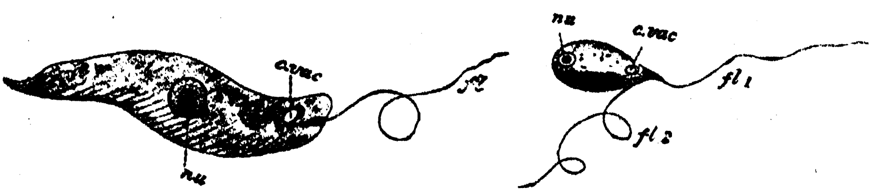


Fig. 7.—*Euglena* (on the left), showing nucleus with nucleolus (*nu*), reservoir of contractile vacuole (*c. vac.*) with pigment spot; anterior flagel'um (*fl*) (Parker after Savile Kent). *Heteromita* (on the right), showing nucleus (*nu*), contractile vacuole (*c. vac*), anterior flagellum (*fl. 1*) and ventral flagellum (*fl. 2*) (Parker after Dallinger).

masses which escape, by ruption of the sac, as spores, each of which is at first an exceedingly minute granule of protoplasm, but soon developes into the more complex adult form. Compare this process with that in higher animals, and note that there is no apparent structural difference between the male (the more active) and female (the more passive) conjugating individual (the gametes) and that the fused gametes form one body (the zygote) which divides up into independent units. The gametes (eggs and sperms) of higher animals fuse together to form a zygote also dividing up into cells which, however, cohere and become specialised to form a large organism.

TRYPANOSOMA (Fig. 8) is another example of the Flagellata, which resembles Euglena in its mode of life, in that it lives in a nutrient fluid the plasma of the blood. It is a comparatively large form (about 20 micromillimetres in length), and is easily detected in fresh blood with comparatively low magnification. It may be seen swimming about actively, moving the blood corpuscles in its course. An oval nucleus occurs in the middle of its elongate body which is blunt posteriorly, and tapers anteriorly into a long flagellum by means of which the animal can swim about. Another nucleus which may have to do chiefly with locomotion occurs near the posterior end. A specialization not met with in any of the other protozoa we have considered, is present; this is a long undulating membrane projecting from the body, starting from the nucleus near the posterior end and running anteriorly into the flagellum. It has a thickened border. Not much is known as yet as to the phases and life history of this protozoan. It is known to increase by longitudinal division, and one observer

has described its transformation into an amoeboid form. Further investigation, however, is being actively carried out, as the parasite has been proved to be the hitherto unsuspected cause of certain diseases, now known as Trypanosomiases. Of these sleeping sickness is one of the most serious.

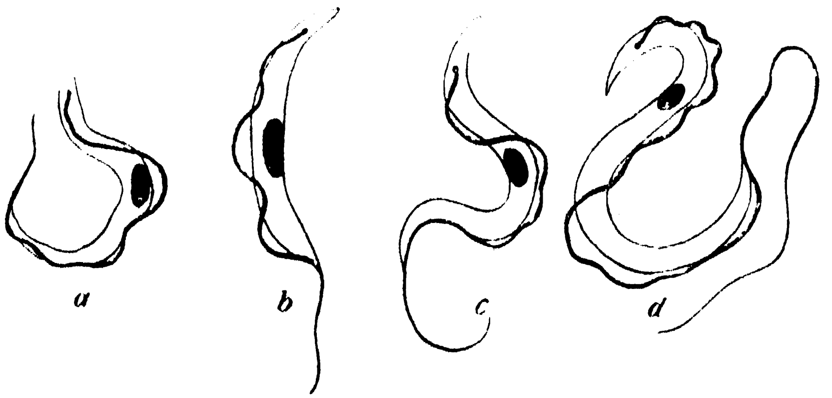


Fig. 8.—Various forms of African Trypanosomes. *a*, *Trypanosoma gambiense*; *b*, *T. brucei*; *c*, *T. theileri*; *d*, *T. nelspruitense*. (After Bruce, Nabarro, Lav. and Mesn.)

Trypanosoma gambiense (Fig. 8 *a*.) was found in the blood of a European in the Gambia, and later in the fluid in the cavity of the brain and spinal chord of a case of sleeping sickness. It was proved that a trypanosoma, now known to be *T. gambiense*, was the cause of the disease, and that it was transmitted by a Tsetse fly (*Glossina palpalis*).

Trypanosoma brucei (Fig. 8 *b*.) has been shown to be the cause of Ngana, or Tsetse fly disease, and it is the most virulent of all Trypanosomes. It is fatal to horses, cattle, dogs, and most mammals, into the blood of which it is introduced by the mosquito (*Glossina morsitans*).

Trypanosoma theileri (Fig. 8 *c*.) produces one form of the disease known as Galziekte, or Gall-sickness, in South Africa. Its affects cattle only, and is transmitted by a fly (*Hippobosca rufipes*). Another trypanosoma (T. transvaaliense), found in the blood of oxen in South Africa by Dr. Theiler, is considered by him to be only a variety of the preceding. Both are peculiar to cattle.

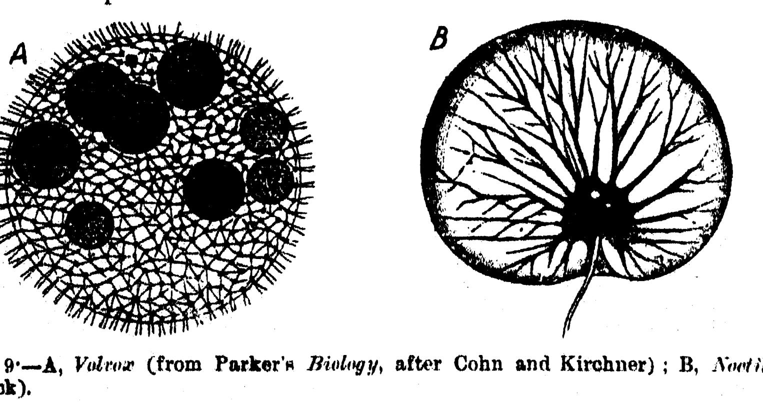


Fig. 9.—A, *Volvox* (from Parker's *Biology*, after Cohn and Kirchner); B, *Noctiluca* (Sedgwick).

Though various species of Trypanosomes are known to occur in Fishes, Amphibia (T. nelspruitense (Fig. 8 *d*.) in frogs in the Transvaal), Birds and Mammals, their life history is very imperfectly known, especially in the intermediate host. Though they are blood parasites, they have been cultivated artificially in a mixture of nutrient agar and defibrinated blood

and it is noteworthy that the virulence of the culture may be completely lost, though the Trypanosomes are still active and growing.

Volvox (Fig. 9 A.) is one of the Flagellata, and may be mentioned, as it indicates an approach to higher form in two respects. First, in that it occurs as a sphere of cells each provided with two flagella, a nucleus and a contractile vacuola. By means of the movement of the flagella, the ball of cells can be rolled along. We have thus as it were a crude metazoan consisting of a number of co-operating cells. Secondly it can multiply by cells resembling the eggs and sperms of higher animals, as well as by internal budding off of new colonies.

Noctiluca (Fig. 9 B.) is another example which may be mentioned. It is of comparatively large size, having indeed been mistaken for eggs of fish in the sea, where it is one of the most frequent causes of "phosphorescence." It has a stout membrane, two flagella, a single nucleus and protoplasm in a network.

Class III.—Ciliata.

This class resembles the Flagellata in having an outer or cortical layer of protoplasm and definite permanent processes. These processes are, however, in the form of many minute cilia, which may become further modified into hooks or suckers. If this were the only difference, they might have been placed in one group along with the Flagellata. The fact, however, that the nucleus is always in the form of one small (micronucleus) and another large nucleus (macronucleus) may necessitate their separation from this group.

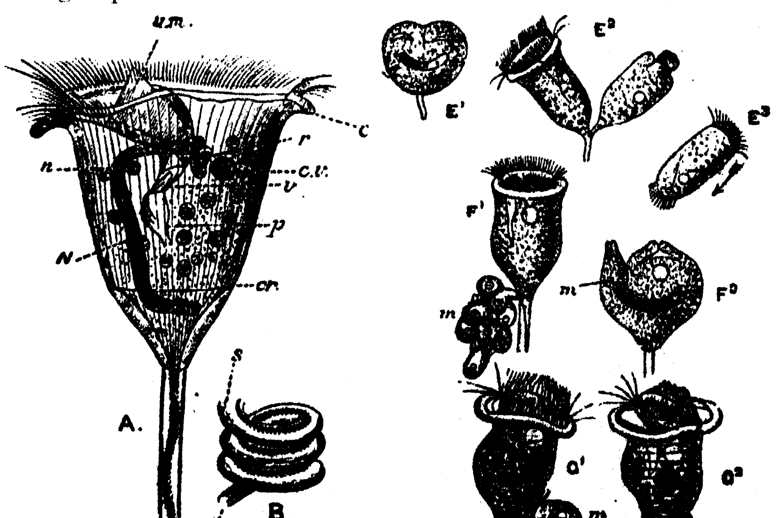


Fig. 10.—*Vorticella*. A, expanded; B, stalk in contraction; *c*, eversible collar below peristome; *cr*, line of posterior ciliary ring; *c. v.*, contractile vacuole; *m*, muscle of stalk; *N*, meganucleus; *n*, micronucleus; *p*, pharynx; *r*, reservoir of contractile vacuole; *s*, tubular stalk; *u. m.*, undulating membrane in vestibule. E^1, E^2, two stages in binary fission; E^3, free zooid, with posterior ring of cilia; F^1, F^2, division into mega- and micro-zooids (*m*); G^1, G^2, conjugation; *m*, microzooid. (From *Cambridge Natural History*, modified from Bütschli, from Parker and Haswell.)

Vorticella (Fig. 10) may be taken as a type to illustrate this group. It is a stalked form and occurs abundantly, attached to weeds, stones, etc., in pools. The body has a denser cortical or outer layer of protoplasm, and this is continued down into the stalk as an *axial fibre*, where

it has a striped appearance like incipient muscular tissue, and is very contractile. Body and stalk are covered by a *cuticle*. A *mouth* and *gullet* are present, and a large horseshoe-shaped *meganucleus*, as well as a smaller *micronucleus*, or para-nucleus. Round the rim or peristome of the bell-shaped body there is a *circle of cilia* by means of which floating food particles may be swept into the mouth and gullet where they are enveloped in the protoplasm in *food vacuoles*; after circling through the body the non-digested remains pass out at a weak spot which is thus a *functional anus*, permanent, however, only in position. Vorticella may become *encysted*. It may multiply by simple *longitudinal fission* into two equal halves. Division may be, however, unequal, and a number of small forms, or *microzooids*, each provided with an extra ring of cilia, may be set free and swim about actively in the water. These may meet and apparently fuse with a normal fixed Vorticella. Here again we have two gametes

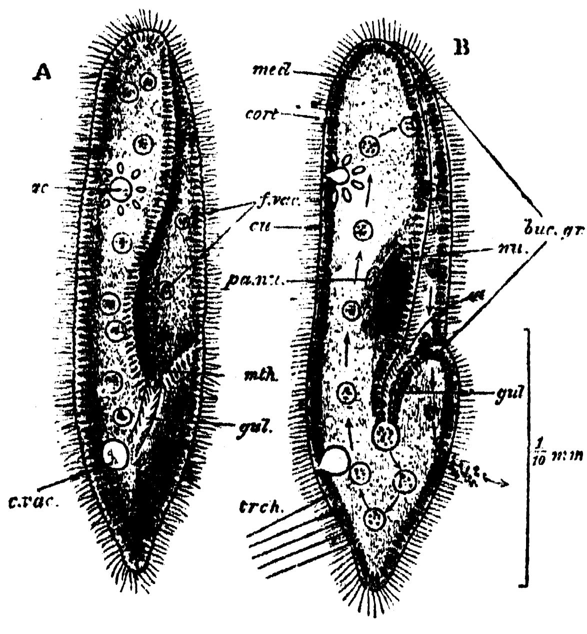


Fig. 11.—*Paramoecium*. A, the living animal from the ventral aspect. B, the same in optical section, the arrows show the course taken by the food particles. *buc. gr.*, buccal groove; *cort.*, cortex; *cu.*, cuticle; *c. vac.*, contractile vacuole; *f. vac.*, food vacuole; *gul.*, gullet; *med.*, medulla; *mth.*, mouth; *nu.*, meganucleus; *pa. nu.*, micronucleus; *trch.*, trichocysts discharged. (From Parker's *Biology*.)

uniting to form a zygote as in Heteromita, but the gametes differ in size as well as in activity. Compare the small active sperm and the large passive ovum or egg of higher animals. The minute *details of the process of conjugation* are very interesting and instructive. The micronucleus of the male divides into eight parts, of which seven disappear while the micronucleus of the female divides into four, of which three disappear, so that there is now only one micronucleus in each; that in the male goes over and fuses with that in the female, forming a new and probably rejuvenated nucleus. Meanwhile the macronuclei have disappeared and a new one is formed in the female from three of four parts into which this rejuvenated nucleus has divided up. The male cell shrivels up and dies, but the female goes on growing and reproducing with renewed vigour. This phenomenon is instructive as again showing that the nucleus is the essential part of the

protoplasmic unit and that it may be specialized into a part, the macronucleus, which, there is evidence to show, has chiefly to do with assimilation and other such processes in the protoplasm, and the micronucleus, which has to do with the sexual process and perhaps has a less intimate connection with the protoplasm. The meganucleus with its associated protoplasm has been compared to the body cells of higher animals which sooner or later die and the micronucleus to the sexual cells of the body which are potentially immortal. The comparison is at least suggestive.

PARAMOECIUM (Fig. 11) may be mentioned as a form easily procurable in solutions of decaying animal or vegetable matter. It is an oblong body covered with cilia by means of which it swims about freely in the fluid. It has a large mouth, contractile vacuoles of a complex form, and two nuclei, the process of conjugation being somewhat similar to that in Vorticella, but there is no distinction between the conjugating individuals, and they separate, each going his or her own way after the process. A number of thread-like projections (trichocysts) may be shot out by way of offensive or defensive organs.

Class IV.—Sporozoa.

There seems to be no available supply not only of dead but even of living organic matter in which Protozoa may not be found. In the living tissue of animals there is an abundant supply, and we find many Protozoa living as parasites in it. The usual effect of an easy mode of life is seen in these animals. They absorb food in a fluid condition through a cuticle which covers them. Thus *mouth, food, and contractile-vacuoles are absent* and there are *seldom any pseudopodia or flagella*; only one drawback remains, viz., that they must change their host, as, if it is not killed by their ravages, it sooner or later dies naturally; hence we find them possessed to a certain extent of organs of locomotion in the form of pseudopodia or flagella; but they are characterised above all by the power of rapid multiplication by division into minute elements or *spores*, usually enclosed in a cyst. They can thus multiply rapidly in their host and have a better chance of being transferred to new hosts.

They may be found in most of the tissues of the higher animals, for instance, MONOCYSTIS is common in the seminal vesicle of the earthworm, where it feeds on the spermatozoa stored up there. GREGARINA, a worm-like form, occurs in various arthropods, *e.g.*, lobster and cockroach, and it lives on the cells of the intestine of its host. Neither of these, however, do much damage, but the same cannot be said of a large number which live on the cells of the blood, especially of warm blooded animals (birds and mammals) in which they give rise to fevers of various kinds. They are usually in the red blood corpuscles, and may be provided with pseudopodia as in Amoeba (HAEMAMOEBA), they may be piriform in shape (PIROPLASMA), or they may be more or less vermiform like Gregarina (HAEMOGREGARINA).

HAEMAMOEBA *malariæ* (*c.f.*, Fig. 12) is the one that produces malarial fever in man, and as it is the best known may be described as illustrative of the group. It may be seen in the red blood corpuscles (non-nucleated) in the form of an independent cell with a large clear space or vacuole and a nucleus, the whole taking a signet-ring form. At a later stage the vacuole disappear, and grains of black pigment are formed (excretory products?); the cell becomes irregular in shape and finally rounded. The nucleus then divides, the various parts passing to the edge and the protoplasms itself divide up into a corresponding number of parts arranged in a *rosette* form with the remains of the protoplasm and the pigment granules in the centre. The blood corpuscle then breaks up, setting free these segments (*merozoits*), which attack other blood corpuscles, becoming in their

turn parasitic in them, and dividing up as before, so that in a short time a great number of the blood corpuscles may be attacked. The host might be thus destroyed, and all the parasites with it, if there were no provision for transfer to another host. Sooner or later among the parasites thus multiplying in the blood there appear sexual forms destined to become gametes. These *gametocytes*, as they are called, differ from the ordinary form, being crescentic or slightly bent, elongate and, when mature, larger

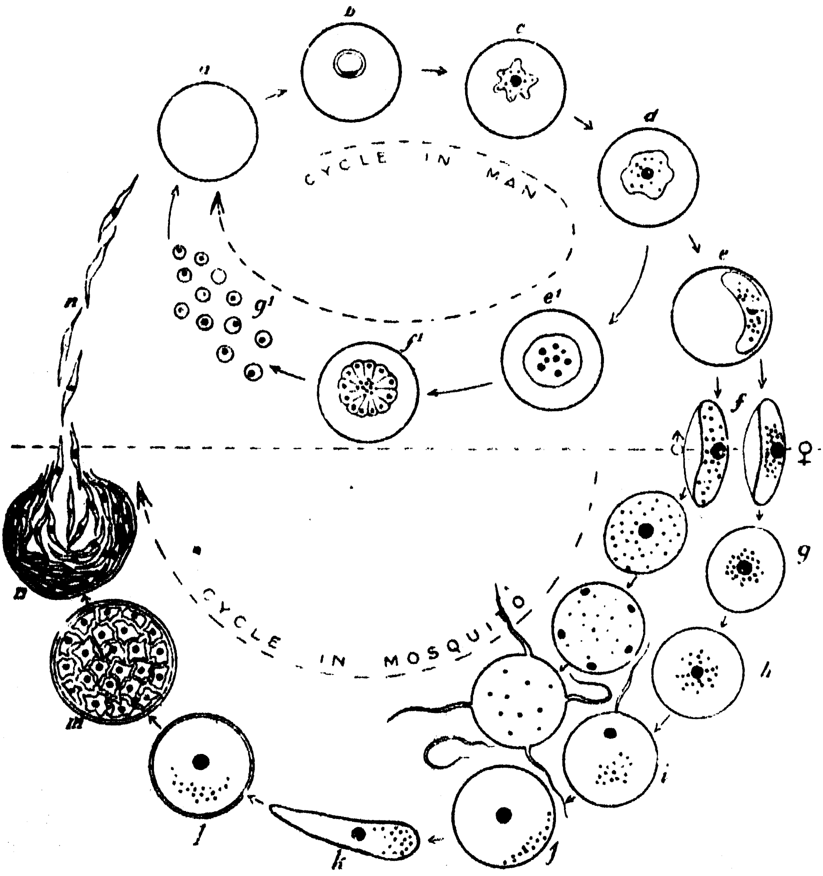


Fig. 12.—*Diagram of the life history of a Malarial Parasite.—The upper series* shows simple sexual division (schizogony) in man; *a*, a normal blood corpuscle of man; *b*, blood corpuscle with parasite (signet-ring form); *c* and *d*, amoeboid forms; e^1, parasite rounded and about to divide; *e*, an indifferent gametocyte (crescent); f^1, rosette form; g^1, merozoits. *The lower series* shows sexual stages (*f*-*j*) and formation of spores (*k*-*n*) in mosquito. *f*, male and female gametocytes; *g*, the same rounded; *h*, male gametocyte breaking up into microgametes (flagella), one of which penetrates macrogamete; *j*, zygote; *k*, vermicule or oökinete; *l*, oöcyst; *m*, the same dividing up into sporoblasts which divide into sporozoits (*n*). The smallest black dots indicate pigment particles.

than the blood corpuscle, the remains of which can be seen attached to it. These forms may be distinguished into males (*microgametocytes*), in which there are pigment spots scattered uniformly, and females (*macrogametocytes*) in which the pigment is gathered round the nucleus. The gametocytes then become rounded and entirely free from the blood corpuscle. They never get beyond this stage in the human subject, but if the blood is taken into the stomach of a mosquito (Anopheles) further changes of a sexual

nature take place. The male or microgametocyte sends out long thread-like processes which become independent actively moving cells (*microgametes*), comparable to the spermatozoa of higher animals. The macrogametocyte also changes, undergoing a process of maturation in which part of its nucleus is given off, as in the egg of higher animals, and it becomes a *macrogamete*. One male element or microgamete then fuses with a female element or macrogamete forming a zygote, an elongate worm-like body (*vermicule* or *oökinete*). All this takes place in the digestive tract of this particular mosquito. (In other biting insects these elements are digested). The oökinete then bores its way through the walls of the stomach and becomes encysted (*oöcyst*). It grows rapidly at the expense of the tissues in which it is embedded, and then divides up into a number of masses (*sporoblasts*), each of which in its turn divides up into great numbers of very small spindle-shaped bodies or *sporozoites*. Finally the whole cyst bursts into the body cavity of the mosquito, and multitudes of small sporozoites are carried by the blood to all parts, but ultimately find their way to the salivary gland. When a mosquito thus infected bites a man, many of these sporozoites find their way into his blood, from the drop of saliva which the mosquito leaves behind, and thus the cycle is completed, as these sporozoits attack the blood corpuscles and increase rapidly as before.

Another Haemamoeba is common in the Pigeon and passerine birds, viz., HAEMAMOEBA DANILEWSKYI, better known as Halteridium from its characteristic halter-like form. It lies round the nucleus of the red blood corpuscle, which in birds is oval and nucleated, not round and non-nucleated as in mammals. Two forms of the parasite occur, one which has its nucleus round and scattered pigment spots (the female), and another

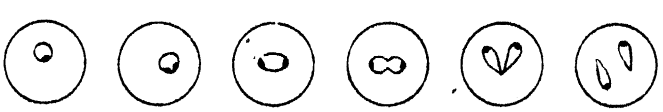


Fig. 13.—*Piroplasma bigeminum*, in blood corpuscle of Ox, showing method of division. (After Laveran and Nicolle.)

which has an elongate nucleus and spots at the ends. After a time the parasite escapes from the blood corpuscle; the male breaks up into a number of minute active bodies or flagella (microgametes), one of which enters a female parasite (macrogamete); and the zygote thus formed becomes an elongate free swimming vermicule. This finally becomes encysted (oöcyst), divides up into sporoblasts, which divide up into sporozoits. Sporulation takes place in the internal organs especially the spleen and bone marrow. The life history of the parasite is not fully worked out, but it is known to be conveyed to the pigeon by a Hippoboscid fly, in which it may multiply sexually. The transformation of the amoeba-like form into a trypanosome has been described by one observer. The parasite can readily be found in the blood of pigeons in South Africa.

HAEMAMOEBA BOVIS is parasitic in the blood of cattle in South Africa (described by Kolle). It has a general resemblance to the malarial parasite, and produces remittant fever and severe anaemia.

PYROPLASMA BIGEMINUM (Fig. 13) was discovered in 1889 to be the cause of Texas fever in cattle, a disease that decimated large herds of cattle in the Southern United States. The parasite is pear shaped, about 2—4 micromillimetres in length, and 1 in breadth, and generally occurs in pairs (hence specific name). It was found that the disease was transmitted by a tick. During the disease about 1 or 2 per cent. of the red

blood corpuscles are affected, and 5-10 per cent. or more at its termination. The number of corpuscles affected is greater in the spleen, liver and kidneys and free forms have been found in those organs in the later stages of the disease. In 1896 Koch found that Texas fever was identical with South African Redwater, a disease which he found had for a long time been endemic all over the East African Coast, the island of Mafia, and probably other East African cattle rearing islands. The disease overran Natal, and has spread as far south as Mossel Bay. Koch also demonstrated that Redwater is transmitted by the common South African Blue Tick (Rhipicephalus decoloratus), and it has been shown that it may be transmitted by other ticks. The effects of the disease are anaemia and haemoglobinuria, the urine being coloured red by the broken down blood corpuscles. The organism is not visible in recovered cases.

Piroplasma equi is found in horses, asses, and mules in South Africa, and it produces one form of "Biliary Fever." Recovery is followed by imunity, and the parasite remains visible in the blood corpuscles of recovered animals. The intermediate host is the tick Rhipicephalus evertsi.

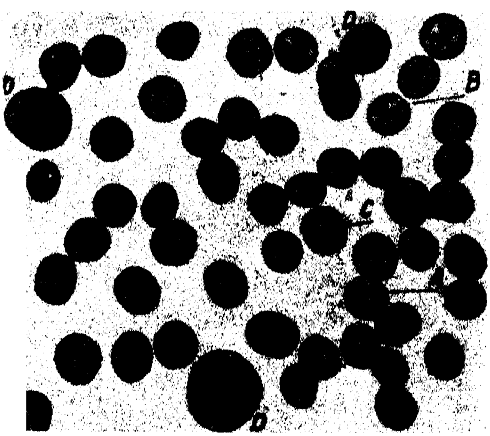


Fig. 14.—*Piroplasma canis*, from blood of dog in South Africa. *A–C*, red blood corpuscles containing parasites in various stages; *D*, white blood corpuscles. (After Jowett.)

Piroplasma canis (Fig. 14) presents much the same appearance as P. bigeminum. It causes the disease known as malignant jaundice in the dog to which it is confined, and cannot be transmitted to other animals. Four to six parasites often occur in each blood corpuscle, the blood of the kidneys being specially rich in parasites. The disease may be transmitted by direct inoculation, but normally is conveyed by the common dog-tick at the Cape (Haemaphysalis leachi).

Piroplasma parvum is much smaller than the preceding species. It is round and baton shaped. At first it was not regarded as specifically distinct from P. bigeminum, and the disease which it produced (African Coast Fever) was thought to be identical with Red Water. Further investigation, however, showed marked differences, *e.g.*, in African Coast fever the parasite is never found in recovered cases, it may be communicated to animals recovered from Red Water, it can only be conveyed by ticks (Rhipicephalus appendiculatus and other species), not by artificial inoculation, and recovered animals are permanently immune which is not the case in Red Water. No method of inoculation has yet been discovered to prevent the spread of the disease.

The third genus of the blood corpuscle parasites is Haemogregarina (Fig. 15). It occurs as a vermiform parasite in the blood corpuscles or free in the blood of fishes, amphibia and reptiles. It does not, however, occur in mammals, and seems to do little injury to the cold blooded animals in which it occurs. Two species of Haemogregarina are recorded from South Africa, H. THEILERI (Fig. 15) and *H. splendens*, from frogs (Rana angolensis) in the Transvaal. Another species I have found to be common in a lizard (Mabuia varia ?) in Cape Colony. It appears to be undescribed, but is allied to H. curvirostris found in lizards elsewhere.

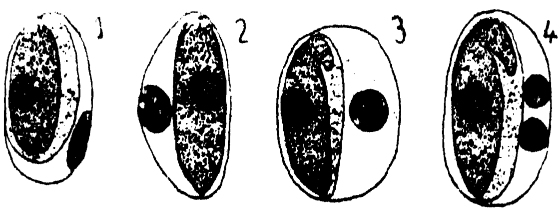


Fig. 15. *Haemogregarina theileri*, 1–4, various forms of the parasite in the blood corpuscle (Laveran). The parasite with its nucleus is on the left of the figures, the nucleus of the blood corpuscle (broken up in *4*) on the right. The lighter shaded part near parasites in *1*, *3* and *4* may indicate a capsule round parasite.

Classification of Protozoa.

I. Rhizopoda, *e.g.*, Amoeba, Difflugia, Globigerina, Actinosphaerium, Actinophrys.

II. Flagellata, *e.g.*, Euglena, Heteromita, Trypanosoma (T. gambiense, T. brucei, T. theileri), Volvox, Noctiluca.

III. Ciliata, *e.g.*, Vorticella, Paramoecium.

IV. Sporozoa, *e.g.*, Gregarina, Monocystis, Haemamoeba (H. malariae, H. bovis), Piroplasma (P. bigeminum, P. equi, P. canis, P. parvum), Haemogregarina (H. theileri, etc.).

Resume of Blood Parasites.

Parasite.	Host	Disease.	Intermediate Host.
Haemamoeba malariae	Man	Malarial fever ...	A mosquito.
„ danilewskyi	Birds	Fever	A hyppoboscid fly.
„ bovis ...	Cattle	Remittent fever ...	?
Piroplasma bigeminum	Cattle	Red water	A Tick.
„ equi ...	Horses, asses, mules	Biliary fever ...	„
„ canis ...	Dog (only) ...	Malignant jaundice	„
„ parvum ...	Cattle	East Coast Fever ...	„
Haemogregarina spp....	Cold blooded animals	?	?
Trypanosoma gambiense	Man	Sleeping sickness...	A Tsetse fly.
„ brucei ...	Horses, cattle and other mammals.	Nagana or Tsetse fly disease.	„
„ theileri...	Cattle (only) ...	Gall sickness ...	A Hippoboscid fly.

(To be continued).

FRUIT PRESERVING FOR FARMERS.

As many enquiries are being received at the Department asking for details as to the preservation of fruits, the following extracts from Bulletin No. 19 of 1907, of the New Zealand Department of Agriculture, written by Mr. Wm. Jacques, Canning Expert to that Department, are published by request of the Horticultural Assistant:—

The condition in which the fruit should be for bottling depends upon the use for which it is intended: If it is to be treated for dessert purposes it should be mature but not soft; if for pie-fruits or for stewing it should be quite on the hard side. Overripe or damaged fruit should be converted into jam or made into pulp for making jam when the fruit-packing season is over. Specked and bruised fruit should not be used unless the bruised parts and the surrounding flesh can be cut away. In selecting the fruits, while it is quite true that any variety can be used, for pie-fruits the cooking varieties give by far the better result; while for dessert fruits, if it is desired to turn out a fine and satisfactory article, there are certain varieties that are so far superior to others that it will be much more satisfactory to select these rather than expend time and money in treating varieties that do not give entirely satisfactory results. At the same time, if a quantity of fruit is available for preserving, there is no reason whatever why it should not be put up for personal or local supply; but if it is proposed to turn the business to commercial account it is most desirable to obtain fruit which is orthodox as to colour, flavour, and appearance, and suitable for the purpose.

Apricots.—These should be selected, developing flavour and sweetness at an early stage of ripening, as well as a good colour. The fruit should not be too large, but of fair size, evenly graded, and clean.

Pears.—The fruit should not be too large, but of good size, evenly graded, and clean.

Peaches.—Any good-flavoured, firm-fleshed fruit will bottle, but deep-yellow or pure-white give the best result. Clingstone fruit has the better flesh, but is somewhat troublesome to prepare unless a pitting-spoon is available to remove the stone; while freestone fruit may be used, provided that the pit is not too large and the pit-pod is free from fibre, light in colour, and easily cut away, otherwise the fibre may separate from the fruit and cause the syrup to become cloudy or coloured, and otherwise spoil the general appearance of the package. The fruit should not be too large, but medium in size, and well graded. Late peaches are better than the early varieties.

Raspberries should be large and well coloured, but not soft, and as fresh as possible.

Strawberries.—These should be of a sort specially grown for preserving, and unless these can be obtained a really satisfactory result cannot be expected. They should be small, round, and a good colour.

Cherries.—Dessert fruits should be large and always pale in colour, though local taste may prefer the dark varieties; but in either case those put up for dessert should be large and carefully selected, the small being put up as pie-fruits. In no case should bruised or damaged fruit be used. Any kind of cherry may be bottled.

Quinces may be bottled. There is little demand commercially, which I attribute to a want of appreciation of a very wholesome, useful, and delicious pie-fruit. Any variety may be used, but choose the best available.

Apples.—The most valuable and obliging of all fruits if properly treated. Apples are sometimes thought too common to preserve in bottles; this may be true from a commercial point of view, but not in the domestic sense, because with care the bottle and cover may be used each season, and the apples are kept for winter use at the expense of only the ring. It is not desirable to put up apples for dessert purposes. Sweet dessert apples do not bottle so well as cooking apples; and, while almost any variety may be used, be careful to choose, if possible, a hard, sour cooking sort, with firm white flesh and a small core.

To Prepare the Fruit.

Never pack two varieties of the same sort of fruit in the same bottle (red currants and raspberries excepted), and always thoroughly sterilise the bottles, covers, and rings before using. Spread the fruit out on a table or bench, which should be fitted with a ledge to prevent the fruit rolling off. The table should be covered with cocoanut matting to make a soft surface, as it is essential not to bruise the fruit. Pick out all specked, bruised, and damaged fruit, and grade the sound fruits into two or three sizes. If the fruit is wet or dirty, it should be washed in salt and water, taken out, and drained. Then proceed as follows:

Apricots.—As apricots are packed with their skins on, any specked fruit will spoil the appearance for dessert, therefore reject all imperfect fruit for this purpose. With a clean, sharp knife cut evenly round the stone, commencing at the stalk end, then take the fruit in both hands, and with a firm but decided twist, without bruising, divide the fruit into two halves, and with a small spoon sharpened at the edges, or, for preference, a pitting-spoon, cut out the stone cleanly; remove the stalk and any loose pieces resulting from an uneven cut, and pack immediately into bottles which have been previously sterilised placing the pieces, skin uppermost, slightly overlapping one another. If carefully packed, the bottles will hold more fruit and have an attractive appearance when finished. Be careful not to press the fruit down, or it will be bruised. Fill the bottle quite full, place your hand over the top, and strike the bottom of the bottle on a wooden table to shake the fruit down, and fill up with fruit till the bottle will hold no more. Then fill up with syrup to the top—a dense syrup for dessert fruits and a light syrup for pie-fruits. Pie-fruits are treated in the same way.

Pears.—Pears should have their skin removed before they are packed. Pick them over carefully, removing all bruised and damaged fruit. Grade them for size. Pare the fruit lengthwise, with a sharp knife with a thin blade, so as not to bruise the fruit, or, if a large quantity is to be prepared, have ready a wire basket or string net, place the pears in this and dip them for about three or four minutes into a boiling solution of caustic soda and water—6 oz. of caustic soda to each gallon of water; take them out and immediately immerse them in a tub of clean cold water, being careful not to bruise them. The skin may then be easily removed. But I recommend peeling by hand as most satisfactory.

If the bottles are not ready, the pears should be put into a brine dense enough to just float a potato. This will prevent the fruit from oxidizing, which it is likely to do if exposed to the air. It is not necessary to wash the fruit after brining, but allow it to drain. The small quantity of brine will not affect the flavour.

When the bottles are ready, cut the pears in halves for dessert and quarters for pie-fruit, remove the core with a pitting-spoon, a sharpened spoon, or wire cutter; also remove the stalk and all loose pieces, and pack carefully into the bottles, outerside uppermost, filling with syrup of medium density for dessert pears, and light density for pie-fruit (see "Syrup"). The bottled pears must be turned about before preserving, to enable the air to escape from the cavity caused by cutting away the core.

PEACHES.—Grade peaches for size and variety, rejecting damaged fruit.

The fruit should be pared by hand. Some prefer to remove the peel first, while others prefer to remove the pit and halve the fruit, peeling each half separately. The latter process gives the better result, and is employed in the best canneries in California and Europe. Much depends upon the fruit to be handled; both ways should be tried. Remember that much handling after the skin is removed will materially damage the appearance of the fruit.

To remove the pit, procure a pitting-spoon made for the purpose; insert this close to the pit at the stalk end and cut it away cleanly from the flesh all round, keeping the spoon close to the stone. It is then quite easy to cut round the stone and divide the fruit into halves.

The fruit is packed flat side downwards, partly overlapping (as recommended for apricots), and the bottles filled up with syrup—heavy for dessert and light for pie-fruit.

Freestone peaches are pared first, cut round the stone, halved, and the pit removed; the fibre in the pit-pod should be cut away so as to leave a clean-cut surface of fruit. All loose pieces are removed, and the fruit packed into bottles, as above.

When a very large quantity is to be prepared, the skins may be removed by scalding in solution for about two minutes and plunging into cold, clean water as described in preparing pears, but I do not recommend this method. It is not employed even in factories, as it is very liable to spoil both the flavour and the appearance of the fruit.

Pie-fruits are sometimes packed whole, but this is not recommended, as the bottles do not hold enough fruit when packed in this way.

PLUMS.—Only the best varieties of plums should be bottled. I do not consider the Japanese varieties or inferior-grown plums worth even the small amount of labour and expense. The Japanese plums do not develop flavour and quality until they are quite ripe. Then they are good enough to eat; but their condition renders them unsuitable for bottling, with a few exceptions.

Pick out all damaged, specked, and over- or under-ripe fruit; grade for size, wipe carefully if wet or soiled, pack straight into the sterilised bottles, and fill with light syrup for dessert fruit and very light syrup for pie-fruit. If the stones are free from flesh, it is advisable to prick the fruit to the pit-pod to allow the air to escape during the process of preserving.

RASPBERRIES AND STRAWBERRIES.—Pick over the fruit, which should not be overripe; remove the stalks and leaves; pack at once into the bottles, and cover with a good, clear, medium syrup—if the syrup is too heavy it will give the fruit too much the appearance of a conserve. Raspberries are only packed as for dessert.

STRAWBERRIES may be treated in exactly the same manner as raspberries.

CHERRIES.—Clean the fruit, first picking out damaged and overripe fruit; remove stalks and leaves, and pierce the fruit down to the stone, or the stones may be removed by a cherry-stoner made for the purpose.

Pack closely in sterilised bottles in a light syrup for dessert and very light syrup for pie-fruit. The darker-skinned varieties may have a slightly heavier syrup.

QUINCES.—Pick out badly bruised fruit; pare and core the fruit, and cut into evenly sized wedges or thin slices; pack in sterilised bottles, and cover with a very light syrup. Quinces are usually packed for pie-fruit or stewing.

APPLES.—These must be carefully selected if it is intended to produce a really good result. The varieties must not be mixed, or the appearance will be spoiled. Pare and core the fruit. This is best done with a machine. Then cut the apples into quarters, according to the size of the apples—large into five, six, or more, medium into four or five, and small apples into four; or, better still, grade the apples, and cut those of each grade into an even number of wedges. Place the apple-pieces immediately into brine to prevent discoloration, allow a few minutes for the fruit to drain, and transfer into sterilised bottles, covering immediately with light syrup. It is desirable to have the apples as white in flesh as possible, and care should be taken to remove all bruises and blemishes.

THE SYRUP.

For the convenience of estimating the density of syrup we take the weight of a gallon of water at 10 lb.: thus, 1 lb. of sugar to 1 gallon of water, or 10 lb. of sugar to 10 gallons, which equals 100 lb. of water, gives us a syrup of 10-per-cent. density; 2 lb. to the gallon gives 20-per-cent.density, and so on. The syrups mentioned herein may be set forth as follows:—

Extra heavy	... 6 lb. to the gallon,	or 60-per-cent. density.
Heavy ...	... 4 lb. ,,	,, 40 ,,
Medium ...	... 3 lb. ,,	,, 30 ,,
Light ...	... 2 lb. ,,	,, 20 ,,
Very light	... 1 lb. ,,	,, 10 ,,

The value of sugars and the weight of water vary somewhat: it is therefore advisable to use a small instrument, costing about 3s. 6d., called a saccharometer, for the purpose of testing the density of syrup, for while some may prefer highly sweetened syrups, others may condemn these as sickly; and, as the strength of the syrup does not materially matter, the preserver should exercise his (or her) discretion, and use a saccharometer as a guide and to insure a regular strength in each batch of fruit.

Take rather more water than may be required—this will be a matter of judgment, the quantity varying according to the space between the fruit; bring it to the boil, and stir in the required quantity of sugar, and simmer steadily for about seven minutes, stirring occasionally, and removing any scum that may arise to the surface. The longer the syrup is worked in this way the denser it will become. Care must be taken not to let it scorch or burn, or the colour and flavour as well as the "texture" will be spoiled. When finished, strain through a piece of muslin into wooden or earthenware vessels, and allow the syrup to cool before filling it into the bottles.

The syrup must be used the same day that it is prepared. If any is left over to the next day it must be again sterilised before it is filled into the bottles; it may be added to the fresh batch of syrup with the sugar.

For canning fruits for commercial purposes very heavy syrups are used for the highest-grade fruits. These are obtainable by evaporation, and sometimes a small spoonful of sugar is also added in the tin. A very small quantity of the finest glucose is also sometimes used, but these methods are not necessary in household preserving.

Sometimes honey is used with the syrup in preserving strawberries, raspberries, and other choice dessert fruits. This is a very good practice. The bee-hives are placed among the fruits for which the honey is intended to be used, in order to obtain an additional flavour. I have tasted fruits treated this way, but considered the too rich and sweet to allow me to eat enough of them. Certainly they were very luscious, but for ordinary purposes I consider a good syrup properly made is sufficient.

The Principle of Preserving.

Several things have to be carefully remembered to enable the preserver to arrive at a successful result. First, the fresh fruit no sooner arrives at a state of perfection than it begins to decay. Then, the more quickly the fruit ripens the more rapid the decay. Thus fresh fruit necessarily contains the germs of decomposition more or less emphasized according to the condition of the fruit. The principle of preserving is to arrest this decomposition by sterilisation, not of the fruit alone, but of the whole contents of the bottle, by driving out and absorbing all the air and gases and preventing any air returning. Thus a vacuum is formed within the bottle or receptacle, and a corresponding atmospheric pressure on the outside, principally upon the cover, this being the part which offers the least resistance. It is not essential to destroy entirely the micro-organisms in the fruit, for if this were done scientifically the fruit itself would be effectually reduced to a mass of pulp by the lengthy and highly heated process; but in a properly procured vacuum (which nature abhors) the germs become dormant and sterilised, and in the absence of air cannot continue the natural process of decay. The fruit therefore remains in its natural condition of freshness as long as the vacuum is effectively maintained, or until the bottle is opened and the vacuum, of course, destroyed, when, in the natural evolution of things, the germ-activity will go on again as from the time when it was arrested by the process of preserving, but at a slightly increased rate resulting from the unnatural check to which it has been subjected.

Sterilising The Bottles, etc.

The bottles and covers should be well washed, and throroughly dried in an oven until they are quite hot. This will effectually sterilise them. It is also desirable to fill the fruit into the bottles as soon after as possible.

Sometimes it is desired to sterilise a large jar when putting up jam or pickles in large quantities. This may be done by procuring a sulphur taper and attaching this to a wire; allow it to burn in the jar (which should be quite dry) for a few seconds. This will have the desired effect, and this method may also be used for sterilising barrels, which must, of course, be previously cleansed and dried. This sterilising must be done just before use, and will not injure the flavour of the goods.

The Process of Preserving Fruit in Glass Bottles.

Having described the principles of preserving, I will now proceed to describe the process by which a proper vacuum may be secured and maintained in bottled fruits. I am aware that a vacuum chamber is sometimes used for certain preserves and confectionery, but this is not satisfactory in preserving fruits. The method in general use, and which supersedes all others for fruits, is the application of heat, which may be either live steam or hot water. Live steam has many disadvantages, and is not suitable for household use, nor is it now employed in preserving

fruit commercially. Water is by far the best method, and is the only means now employed in preserving fruits in bottles. Water can be brought to a higher temperature by the addition of certain chemicals, but this need not be discussed here, as I do not find it necessary to employ water at boiling-point or over. It will be well, however, to offer a word of warning against the use of sea-water. A case came under my notice where, fresh water being scarce, sea-water was used for the preserving-bath, and, although the preserver had been usually successful in the past, he was surprised on this occasion to find his fruit over-preserved, in consequence of the sea-water, which, being of greater density, reached a higher temperature than he intended.

The utensil to be employed may be the ordinary domestic boiler (or copper), or a suitable preserving-bath may be made at small cost, having a tray made to fit the inside closely, and deep enough to allow the water to completely cover the tops of the bottles to a depth of one or two inches. The tray should be made of strap iron and galvanised, light in weight consistent with strength, and fitted with rope handles (not metal) to enable the operator to lift the tray containing the bottles bodily out of the bath. Several baths of his description can be employed if necessary, or a larger bath to hold two, three, or four trays can be employed according to the quantity of fruit to be preserved. If the copper boiler is to be employed as a preserving-bath, as is usually the case, I strongly recommend the use of a galvanised wire basket, made to fit the inside of the boiler. This will enable the preserver to submerge all the bottles of fruit in one operation, and, what is more important, to lift them all out at one time, and so avoid the trouble and annoyance which generally occurs with that last bottle which "declines to come out" when a wire basket is not used.

The cost of the few appliances which I urge all fruit-preservers to provide themselves with is so trifling, and, seeing that they will pay for themselves the first year in the improved quality and extra quantity of finished bottles, that they can be used for other purposes when not employed for fruit-preserving, and if taken care of will last for many years, the outlay can only be considered in the light of a good investment.

Those that are necessary and important are:—

(1) A suitable tray or basket.

(2) A bath-thermometer.

(3) A pitting-spoon.

In addition to the above, it is well to be provided with a sieve, a wooden tub, a wooden or enamelled bucket (large size), a saccharometer for testing syrup, and a paring-knife. A large stewpan and a wooden spoon are also sometimes required.

Put sufficient water to completely cover the bottles in the copper or bath (which for brevity will be hereinafter refer to as the "bath"), and set the fire going. Tie a piece of string to the loop of the thermometer, and suspend it in the water so that it may be easily read. While the water is heating see that the covers of the bottles are fitted correctly and quite loosely on the bottles, but not so loosely as to be liable to fall off in the bath; also see that the indiarubber rings fit correctly and are sufficiently soft and not perished by age. It is false economy to use old or previously used rings; if they are round in shape they must not have a twist in them. Pack the bottles then closely into the basket (or tray); it is not necessary to pack hay or straw between them, as they will not be likely to dance about and strike one another in the temperatures we are about to use, as they would when water is brought to boiling-point (212° Fahr.) or over.

The bottles of fruit being now prepared and packed in the basket, watch the thermometer until the water reaches a temperature of 130° Fahr., not more, and not less except in cold weather, which rarely prevails when fruit is to be preserved. Then take the basket and place it with the bottles into the bath, the bottles being entirely submerged one or two inches below the surface of the water. It may be imagined, the covers being loose, that either the syrup will get out and mix with the water or the water will get into the bottle and mix with the syrup; but neither will happen, as when the bottles are submerged in cold water (which I do not recommend, although it is an old-fashioned method sometimes employed). It may also be imagined that the bottles will break, but this is not at all probable if they are properly annealed as they should be. Also, it is often thought that the indiarubber rings may not withstand the heat if fitted into the bottles and subjected to the necessary heat in preserving. These are suitably carbonized for the purpose, and no fear need be entertained on this account.

Now, watch the temperature of the water continue to rise until it reaches 160° Fahr., and at this point it is necessary to note the time carefully, and to count from this the number of minutes usually required for the preserving process. The action of the fire must be looked at and regulated, so that when the required heat is obtained it can be kept steady at this, instead of getting much too hot or not hot enough. This may be done by regulating the quantity of fuel and by opening or closing the door or damper as may be necessary.

As previously stated, no hard-and-fast times and temperatures can be laid down; but the following table is as near as can be, if the fruit is of correct variety and condition, as recommended:—

Immerse the bottles at 130° Fahr.

Count the time from 160° Fahr., and preserve:—

Apricots	at 180°—185°	for 13 to 15	minutes,
Pears	,, 190°—195°	,, 15 to 20	,,
Peaches	,, 190°—195°	,, 15 to 20	,,
Plums	,, 185°—190°	,, 15 to 17	,,
Raspberries	,, 175°—180°	,, 15	,,
Strawberries	,, 175°—180°	,, 15	,,
Gooseberries	,, 180°—185°	,, 13	,,
Cherries	,, 195°—200°	,, 15 to 17	,,
Quinces	,, 195°—200°	,, 15	,,
Apples	,, 185°—190°	,, 12 to 15	,,
Currants	,, 180°—185°	,, 10 to 15	,,

As a practical guide the foregoing table will be found reliable, but it will be necessary in some cases to regulate the period and temperature according to the variety and condition of the fruit. For instance, there are many excellent apples which at 180° will become pulp in eight or nine minutes; it is obvious that these are not suitable varieties for preserving. On the other hand, there are others which will require cooking for twenty to twenty-five minutes before they will be sufficiently cooked. Then, again, a variety grown rapidly in a warm climate will not require so much heat, but a longer time in preserving than the same variety grown more slowly under less forcing conditions. Therefore I recommend an experiment to be made with two or three bottles,

so that the time and temperature suitable to the particular variety or condition of apple or other fruit to be preserved may be precisely determined. The many details which it is necessary to bring to the preserver's notice may appear very complicated, but there should not be the least discouragement on this account, for a very little practical experience will make all things quite plain and prove many times more instructive than volumes of theory. At the same time, the rule that the softer the condition of the fruit the less the heat and the longer the process will be a safe guide to success.

Having preserved the fruit according to instructions, lift the basket from the bath, and with some pieces of sacking made to fit the hands, take each bottle while hot and screw down the cover without any delay. Stand the bottles on a wooden floor or a piece of board (not on stone, cement, or damp earth), and cover them with a piece of sacking or cloth to protect them from a draught of cold air, which might cause the bottles to crack or break, and leave them thus until the next day. Then examine and test them, and if necessary give the covers a further screw-down (except when Mason jars or jars in which the rubber is likely to be disturbed are used). Clean the bottles, label them, wrap each in paper, which again label outside, and store in a cool place in an upright position. The paper wrapper prevents the action of light deteriorating the colour of the fruits.

The fruit when cooled and finished should be quite firm in the bottles, the syrup clear and of a creamy texture. If the fruit appears extra firm before it cools, this need not cause much concern, because the heat of the syrup will continue to act in cooking the fruit still more after it is removed from the preserving-bath. Before the bottle is finally cleaned and wrapped it will be advisable, if possible, to test each bottle. Where the tin cover is loose a sharp tap with a nail or knife-handle will give a crisp ringing sound, evidence of the vacuum upon the bottle; but should the sound be dull and hollow it will be evidence that the air has not been properly exhausted, in which case there will be no vacuum, and it will be necessary to thoroughly inquire into the cause, rectifying the trouble, and to again preserve the bottle or to use the fruit at once, or pulp it, or convert it into jam. In preserving perform precisely the same processing in the bath, but for two-thirds of the time only, as in all probability the fruit may become pulpy, certainly too soft, but at the same time quite usable.

Another method of preserving fruits is to subject them to the process of preserving. This is an improvement on the simple method just described, and is usually adopted commercially, as the fruit will be more certain to keep sound for a longer period. A strong steel clip fits down closely to the cork during the process of preserving, and prevents the cork from being blown out of the bottle. The fruit is very lightly cooked and filled into hot bottles; the process of preserving is the same as regards times and temperatures as given in the table above. Then remove the bottles from the bath, and when cold remove the clips, cut the cork flush with the bottle, finish off with wire, and dip in the mixture of resin and beeswax as advised.

Many persons pack pie-fruits in water only. I do not recommend this practice, because the flavour of the fruit is much deteriorated, while the addition of 1 lb. of sugar to the gallon of water will make little difference in the cost, and will fix the flavour in the fruit and produce a distinctly improved package when compared with fruits packed in water only.

Some people use a small quantity of preservative, such as boric acid or salicylic acid, with these fruits, but I do not recommend this; in fact, it is quite unnecessary when fruits are properly preserved and

all details are given intelligent attention. Preservatives are extremely useful when properly employed, but their use is often abused. The medical officers ought to insist on all preservative compounds bearing full instructions as to their use, and a warning against using too much. There is a difference between the use and abuse of a very useful article.

The bottles of fruit, when finished as advised, may be improved in appearance by the tops being covered with thin tinfoil, neatly folded over and rubbed down smoothly.

When storing these bottles it is sometimes advisable, especially when they are not corked by a machine, to lay them on their sides, so that the corks may be kept moist. These and all other bottled fruits should be wrapped to prevent the light spoiling the colour.

FRUIT EXPORT.

Return of Fruit Shipped from Cape Colony during June, 1909.

Port of Shipment.	Destination.	No. of Packages.	Description of Fruit.	Quantities.	Value. £	s.	d.
Port Elizabeth	England ...	8,629	Oranges ...	358,433	1,017	18	0
" ...	" ...	9	Naartjes ...	160	2	10	0
" ...	" ...	189	Pines ...	2,268	5	0	0
East London	" ...	1	Oranges ...	48	0	2	0
"	" ...	1	Pines ...	72	0	10	0
Cape Town ...	" ...	721	Oranges ...	29,080	270	19	0
...	...	914	Naartjes ...	52,906	199	18	0
...	German South West Africa	250	Apples ...	45,250	99	9	0
		115	Oranges ...	18,568	42	15	6
		30	Naartjes ...	7,200	20	9	0
		17	Pears ...	3,278	17	15	6
		24	Pines ...	1,287	10	5	6
		25	Bananas ...	13,080	17	14	0
		12	Lemons ...	2,100	4	3	0

EAST COAST FEVER.

The following is a resumé of the steps which have been taken by the Government for safeguarding this Colony against the introduction of East Coast Fever from the adjoining Colonies of Natal and Transvaal. The main considerations which have been kept in view are efficient fencing of the Borders, adequate patrolling of the fences and an embargo on the introduction from the infected Colonies of animal produce, grass, hay and other articles which are capable of conveying infection.

The disease has not been reported from the Bechuanaland Protectorate, but in view of the fact that a comparatively small portion of the Protectorate-Transvaal Border is fenced, our Protectorate Border is also guarded.

The following is the distribution of the guards employed and the strength of the respective cordons on the three Borders as well as the Ports of Entry for trade purposes:—

Cape-Bechuanaland Protectorate Border (about 300 miles).—Guarded and patrolled between Ramathlabama and Kuis by 19 C.M.P. and 3 Native Detectives. Camps established at Ramathlabama, Pitsani, Tsedilomolomo, Packenham, Detlaraping and Morokwen.

Cape-Transvaal Border (about 262 miles).—Guarded and patrolled by 34 C.M.P. and 1 Detective. Camps are established at Christiana Gate, Thornhill, Kopje Enkel, Home Rule, Pudimoe, Malalaring, Mosymiyani, Broeders Puts, Welverdiend, Rosaquali, Kraaipan, Maritzani Eye, Rietfontein, Rooigrond, Malmani Road and Ramathlabama.

Cape-Natal Border (about 330 miles).—Guarded and patrolled by 109 C.M.R. and 136 Natives. Three special Native Detectives are also employed in each of the Districts of Umzimkulu and Bizana. Camps are established at Bonnyvale, Stanford's Drift, Brighton, Middleton, Riverside, Railway Camp, Arnolds Drift, Waterfall, Umfulamuhla, Union Bridge, Stranger's Rest, Middleford, Gloucester, Iron Latch, Gugweni Gate, Harding Gate, Staffords Gate, Ingeli Gate, Amanzimyama, Boshof's Drift, Owen's Camp, Webster's Drift, Davies' Camp, Impindweni, Lugie, Middledrift, Gunther's Camp, Clark's Camp, and Umtamvuna Mouth.

At the end of 1907 the strength of the three cordons was as follows:

Bechuanaland Protectorate: Nil.

Transvaal: 25 Non-commissioned Officers and Privates of the Cape Mounted Police, 1 Native Private, and 1 Detective.

Natal: 95 Cape Mounted Riflemen and 32 Native Guards.

A recent inspection of the Cape Colony-Protectorate Border near Kuis (the most westerly point guarded by this Government), made by the local sub-inspector of the C.M.P., indicated the advisability of stationing men in the vicinity of Kuis and Medebing, and mounting them on camels, as, owing to the long distances to be traversed and the scarcity of water, supervision on horseback was out of the question. 3 camels have been purchased for this purpose. Patrolling of this border has so far had a moral value only, for the reason mentioned. Fencing of this border is not considered necessary at the present time, but the fencing of the portion from Ramathlabama to Pitsani is under consideration, as illicit introductions, of which several have taken place so far, generally occur along this section, which has a length of about 45 miles.

Border Fences.—The frequency with which repairs of the Transvaal Border fence were needed suggested a thorough inspection of this fence. As a result it is found necessary to overhaul the whole line of fence, which consists in part of four and five wires only. The strengthening of the fence is now in hand. When these repairs are completed the fence will consist of six wires throughout, and be serviceable and durable. All additional and renewed wires will be barbed and all unsound poles replaced with iron standards.

On the Natal Border the fencing of the section Boshoff's Drift to the sea (Pondoland Border) was completed at the end of September, 1908. Owing to heavy rains and washaways, the failure on the part of one of the successful tenderers to reach expectations, and the length of the boundary turning out to be nearly double the distance anticipated in view of the course taken by the Umtamvuna River, this fence was finished about three months later than was intended. The fence erected for Rinderpest purposes, having been in existence from the Drakensberg to Boshoff's Drift and since repaired, it was only necessary, in order to complete the fencing of the whole of the border, to erect the section from Boshoff's Drift to the sea. In the beginning of 1908 considerable pressure was brought to bear in favour of a clear zone along the entire border, and a belt of 800 yards was established, from which all cattle were excluded except cattle to be milked or yoked and those used for the cultivation or removal of produce and transport of goods from the Ports of Entry in that section of the zone extending from the Basutoland Border to Ingeli. This was, however, found to be impracticable and also likely to alienate the border farmers in so far as the section from the Drakensberg to the confluence of the Umzimkulu and Ibisi Rivers (about one-half of the border) was concerned; and to that extent the belt was accordingly withdrawn. The same reasons applied also to the portion of the border north of Alfred County; but as this section had not the advantage of a river frontage, it was deemed advisable to erect a double fence about 50 yards from the then existing fence along this extent (about 50 miles), and upon completion of this fence, in August, the 800 yards belt along this section also was withdrawn. Meanwhile, an inspection by the Resident Magistrate of Umzimkulu of portions of the fence along the Umzimkulu River indicated that the fence from the Drakensberg to the junction of the Umzimkulu and Ibisi Rivers needed overhauling. A competent officer of the Public Works Department was detailed to inspect the whole of that portion of the fence (170 miles). In some parts silt and rubbish had washed up against the fence to a height of 2 feet, thus lowering it to only 2½ feet. Extensive repairs were also recommended to place that section in the condition required to afford suitable protection against the introduction of cattle from Natal. Immediate steps were, therefore, taken to effect these repairs, at a cost of about £2,700, the fence being at the same time heightened to 5 feet 6 inches in those parts where the configuration of the ground rendered a height of 4 feet 6 inches inadequate.

It has long been felt that for the proper protection of Pondoland it would be preferable to come to an arrangement with the Natal Government for the fencing of the Umzimkulu River from the point where it enters Natal territory to the sea, owing to the precipitous banks of the river and its affording a securer barrier than the Umtamvuna River, which is shallow and easily crossed. Alfred County, however, lies between these rivers, and if the Natal Government agreed to the lower Umzimkulu being regarded, for East Coast Fever purposes, as the Cape Colonial-Natal boundary, restrictions as regards the movement of cattle between Alfred County and this Colony would require to be relaxed. The Natal Government readily met the wishes of this Government, and

a meeting was accordingly arranged of the Chief Veterinary Surgeon of this Colony and the Divisional Engineer of the Public Works Department at Kokstad with the officers of the Natal Government for inspecting the lower Umzimkulu, as a result of which it was found that from about November to the end of March it was impossible for cattle to cross the river, while during the remaining months of the year, when the river was not in flood, the cattle could not cross with safety except at two places. The expense of fencing the lower Umzimkulu was, therefore, not justified, and it was decided, for the present at any rate, simply to guard those drifts at which it would be possible for cattle to be brought into Alfred County from the remainder of Natal. This is being done at the expense of the Cape Government. At the same time the guards on the Pondoland border are being maintained at their full strength.

Restrictions.—The following are those at present in force:—

(*a*) From Natal no cattle, animal produce, grass, hay, reeds, rushes, herbs, plants (other than cultivated ones) or other vegetable matter can be introduced. Through Stanford's Drift, Union Bridge, Harding Gate, Ingeli Gate, Webster's Drift and Middledrift only vehicles and goods not prohibited which have been hauled all the way to the Border by equines from Donnybrook, Ixopo, Harding or Port Shepstone, as the case may be, are admitted. Through Riverside all livestock other than cattle, sheep and goats, and all articles and things whereof the introduction is not specially prohibited and which are not conveyed in cattle trucks are admitted by rail only. This Port is also open for equine transport used solely for the conveyance of passengers and their personal effects. Sheep and goats can only be introduced through Stanford's Drift, across Union Bridge and at Ingeli after having been dipped under supervision in an arsenical dip.

(*b*) From the Transvaal the introduction of cattle, grass, hay, reeds, rushes, cattle manure, and *green* hides, skins and horns is prohibited. Vehicles drawn by equines can cross the border at any gate, but those drawn to the border by cattle can only enter at Rooigrond and Mosymiyani after being outspanned on the Transvaal side, whence they are drawn across the border by mules. *Dry* hides, skins and horns have to be properly cured and dressed, and be accompanied by a certificate by the Principal Veterinary Surgeon of the Transvaal to this affect. Wool and mohair must be properly baled and come direct to a railway station between Mafeking and Fourteen Streams for consignment to a port without being opened *en route*.

(*c*) From the Bechuanaland Protectorate the introduction of all cattle other than slaughter stock is prohibited, and slaughter stock have to be dipped under supervision at Ramathlabama before they enter.

(*d*) From Rhodesia the introduction of cattle, grass, hay, reeds, rushes and *green* hides, skins and horns is prohibited. *Dry* hides, skins and horns can enter only under the same conditions as in the case of the Transvaal.

(*e*) From the coast north of Durban the introduction of cattle, sheep, goats, buffaloes and antelopes is prohibited.

The grazing or depasturing of any horned cattle on the land lying between the Ingwangwane, Indowane, Umzimkulu and Umtamvuna Rivers and the Border Fences is prohibited under penalty of immediate destruction without compensation, while the removal from the same area of grass, hay, rushes, reeds, herbs, plants and other vegetable matter liable to carry ticks is also prohibited.

An Advisory Board, composed of Europeans and Natives, to assist the local Magistrate, has been formed at Umzimkulu. This Board has been of considerable assistance to the Department, and has been the means of establishing a system of co-operation between the Government and the local people.

The following is an extract from a report furnished by the Chief Magistrate, Umtata, in September, 1908:—

"At the meetings held by me with the Natives in Eastern Pondoland, "at Bizana, Flagstaff, and Lusikisiki, I fully explained the nature of "East Coast Fever and the means by which the disease was spread and how "its introduction could be prevented. I found a most excellent spirit "prevailing; the people expressed their hearty thanks to the Govern-"ment for the steps already taken to prevent the disease from entering "the Territories from Natal......... The danger of infection being intro-"duced arises from several causes. First, there is the very natural desire "on the part of Natives in Alfred County, Natal, who are Pondos or "allied to that tribe, to remove their cattle as the disease approaches, "and place them for greater safety with relatives and friends in Pondo-"land, and of Bacas and Hlangwenis in Natal endeavouring to remove "cattle to their fellow tribesmen in the District of Umzimkulu. Against "this I most strongly cautioned the Natives at all the meetings held by "me. The second cause arises from the fact that cattle can be purchased "very cheaply in Natal, more especially in the neighbourhood of infected "areas, and there is always a danger of unscrupulous persons, for motives "of gain, endeavouring to evade the regulations, and introduce cattle "which in the Umzimkulu and Eastern Pondoland districts are in "demand at fair prices for the purpose of cattle contracts in procuring "labourers for the mines. This can only be prevented by the unfailing "diligence and alertness of the border guards and co-operation of the "farmers and Natives. I am pleased to state that reports from all "sources show that the whole of the border is being most carefully "guarded, and men are alive to the very responsible nature of their "duty. The third source of danger arises from the use of oxen for "transport purposes, but under existing conditions I do not advise any "alterations."

Eleven men have been specially appointed for the purpose of repairing any breaks which may occur in the fence along the Natal Border. These men move constantly up and down the fence, each taking a defined section, and at the same time do the duty of guards, while 44 additional Natives have been specially engaged to guard the drifts across the Umzimkulu River to its junction with the Ibisi River to prevent cattle being smuggled across at night.

Depots have also been established at Riverside, Umzimkulu and Bizana, where an emergency stock of fencing materials has been stored to enable the Government to cope without delay with any outbreak, in the event of the disease crossing the Border.

A Veterinary Surgeon was specially detailed for examining outbreaks of disease on the border, both in this Colony and in Natal territory, for the purpose of ascertaining the nature of the disease.

Special legislation (Act No. 17 of 1908) has been passed giving full powers for dealing with any outbreak of East Coast Fever, and the Department is, therefore, in the position to take prompt measures should it unfortunately be necessary to do so.

The Government has determined to adopt a policy of clearing the Districts which border on Natal as far as possible of ticks and, with this object in view, is about to take the following measures, viz.:...

1. Dividing fences between the Lower Locations in the Umzimkulu District and the adjoining properties will be erected under the Fencing Acts as soon as possible.

2. An inspection is to be made with a view to determining the most suitable and economical line for erecting a new fence from Fort Donald through Pondoland to the sea, in the event of the necessity hereafter arising for providing a further line of defence.

3. The erection of twenty Cattle Dipping Tanks will be immediately undertaken on approved sites and 20 miles or less apart within a belt extending 20 miles from the Natal Border, within which belt periodical dipping will be made compulsory as soon as the tanks are completed.

4. Stock inspection will be arranged for at Government expense.

5. Supervision of dipping will be provided and dip supplied (*a*) at cost of owners in European areas; (*b*) at cost of the Council in District Council areas, and (*c*) out of the proceeds of a special tax of 2s.6d., which will be re-imposed in non-Council Native areas.

6. The offer of monetary grants on the £ for £ principle in aid of the construction of Cattle Dipping Tanks has been withdrawn, and is being superseded by a system of advancing loans from public funds subject to repayment with interest in annual instalments.

Cattle dipping.

The Cattle Cleansing Act No. 31 of 1908 may be taken as the first step in the direction of legislation for preventing the spread of ticks by the removal of cattle. The main provisions of the Act are that tick-infested cattle may not be on any main, divisional or municipal road, nor on any public outspan or commonage, unless they have been cleansed within 14 days, and they must be under the control of a competent person. This does not, however, apply to cattle of persons within the boundaries of their properties. Cattle on such a road or place may be inspected by a Field-cornet, Justice of the Peace, Sheep Inspector or Police Officer, any of whom may demand to see the certificate required by the Act. These officers are also enjoined, if the certificate be not forthcoming, to cause the cattle to be cleaned at the cost of the owner.

By Proclamation No. 521 of 1908, the term "cleanse" was defined and the form of certificate required prescribed.

The Act has been proclaimed in force in the Divisions of East London, King William's Town, Komgha, Albany and Butterworth, and is being extended to the Port Elizabeth, Fort Beaufort and Alexandria Divisions. It leaves Divisional Councils to decide whether it shall be enforced in their division or not.

Fair progress has been made in regard to the construction of cattle dipping tanks, which are distributed as follows:—

List of public and private cattle dipping tanks.

District.	*Public Tanks.*	*Private Tanks.*
Albany ...	Grahamstown ...	Mount View, Manly Flats, Jericho, Thorneycroft, Glen Boyd, Ballinafad, Southeys Hoek, Ashtondale, Ward Vale, Clay Pits, Frazer's Camp, Bucklands, Crosslands, Hebron, Sweet Kloof, Pleasant Prospect, Mount Pleasant, Woodlands, Middleton, Ellende, Schmit Kop, Woodberry, Retreat.

District.	*Public Tanks.*	*Private Tanks.*
Alexandria	Alexandria Commonage, Paterson Commonage, Graaff Water, Doornkloof.	Hopefield, Leeuwenbosch, Bushy Park, Hilary, Bluegum Villa, Sea View, De Grip, Thornhill.
Adelaide		Saxfold Park, Elandshoek.
Bathurst	Round Hill Outspan, Brak River Outspan, Bathurst.	Greenfountain, Thornhill, Tharfield, Lombards Post, Mt. Wellington, Rokeby Park, Summerhill, Theopolis, Coombs.
Bedford	Klipplaat ...	Bellevue, Cullendale.
Butterworth	Butterworth Commonage	
East London	East Bank Location	Dreyer's Hoek, Prospect, Hillside, Elliottdale, Shelford, Ferndale, Amalinda, Farms 10 and 89 in Ward 5, Farms 154 and 113 in Ward 6, Gonubie Park, Lilyfontein.
Engcobo ..	Engcobo Commonage	Nil.
Fort Beaufort ..	Fort Beaufort, Yellowwoods Outspan	Baddaford, Olive Cliff, Septon Manor, Rocklands, Rietfontein, Clifton, Botha's Post.
George ..	George Town, Diepkloof, Woodville.	Nil.
King William's Town.	King William's Town, Berlin Commonage, Keiskama Hoek, Welcomewood	Gray's Drift, Gobongo Park, Gonubie, Mowbray Park, Sparkington, Izeli.
Knysna	Knysna, Eastbrook	Nil.
Komgha	Komgha Commonage	Lincoln, Kei Bridge, Stainland, Annexation, Mooi Plaats, Farm 267, Kwelera; Farm 292, Farm 287, Waterfall, Keikop, Ewanrigg, Lower Kuku, Lot 46, Westbury, Thorn Park, Denston.
Mount Currie .	Hermon ...	Fairview.
Mqanduli .	Mbozisa ...	Nil.
Nqamakwe .	Blythswood ...	Nil.
Port Elizabeth	Port Elizabeth (in course of construction)	Bushy Park, Little Chelsea.
Stutterheim	Bolo Police Reserve	Cloverdale, Quetta, Wetherrun, Waterford Estate, Woodridge.
Uitenhage	Glen Connor ...	Cuyler Manor, Perseverance, Prentice Kraal, Maitland River, Coegas Kop, Tankatara, Aloes.
Umtata	Umtata ...	Nil.
Umzimkulu	Umzimkulu, Lourdes, Riverside.	Sneezewood.
Victoria East	Alice, Calderwood	Alandale, Witney, Nottingham.

In addition to the foregoing, Cattle Dipping Tanks, which are available for use by the public, have been constructed by the District Councils in the following Districts of the Transkeian Territories, viz.: Elliotdale (1), Engcobo (2), Idutywa (1), Kentani (3), Mqanduli (2), Qumbu (1), Tsolo (1), Umtata (3), Umzimkulu (2), and Willowvale (1), while 2 tanks are being constructed in the Mount Ayliff District.

In Pondoland 16 tanks have been completed, distributed as follows: Bizana, Libode and Ngqeleni, 3 each; Flagstaff, Lusikisiki and Tabankulu, 2 each; and Port St. John's, 1.

For dipping in the districts in the Native Territories under the Transkeian General Council funds to the extent of £1,000 were provided by the Council for the financial year 1908-1909, in order to popularise the practice of periodically dipping large stock, while the Natives have already been and continue to be urged by Government officers in the Territories to take advantage of the facilities provided for cleansing their cattle.

In several instances the firm of Messrs. McDougall Bros. has been undertaking the trial dipping and instructing the Council's employés, while in Tembuland and the Transkei results of previous dipping are said to be steadily making a favourable impression, and to be the means of spreading the desire for it.

The question of supervising dipping operations in Pondoland, where the difficulties are far greater, is at present under consideration.

Arrangements have been made for one of the Veterinary officers of the Department to make a tour of the districts chiefly concerned, with a view to encouraging the dipping of cattle, and giving the necessary instructions in the mixing of the Dip.

ANIMAL DISEASES—CONTAGIOUS AND INFECTIOUS.

Summary of Outbreaks of Contagious and Infectious Animal Diseases Scheduled under Act No. 27 of 1893.

Still under Quarantine on 30th June, 1909.

Albany	1								1
Albert							1		1
Alexandria					1				1
Aliwal North							1		1
Barkly East				2					2
Barkly West				1					1
Bredasdorp			1						1
Cape								1	1
East London	2			4			6		12
Fort Beaufort					1		1		2
Hay				1					1
Herschel							2		2
Humansdorp		3				1			4
King William's Town	2			12			6		20
Komgha				3			4		7
Mafeking							2		2
Peddie			2	2					4
Port Elizabeth						2			2
Prieska					1				1
Stockenstrom							2		2
Stutterheim				6					6
Wodehouse				1	1				2
Tembuland.									
Umtata				9					9
Engcobo				25					25
St. Mark's				6	8		3		17
Mqanduli				10			6		16
Elliotdale				2			1		3
Transkei.									
Butterworth				3		1	1		5
Kentani	1			6			9		16
Nqamakwe				8	1		3		12
Tsomo				2	3		1		6
Idutywa				5			1		6
Willowvale				23			12		35
Port St. John's				2					2
Pondoland.									
Libode				4			1		5
Ngqeleni				7					7
Lusikisiki				2					2
Bizana				1					1
Flagstaff				1			2		3
Tabankulu				10					10
East Griqualand.									
Mount Ayliff				1					1
Umzimkulu							2		2
Qumbu				13			1		14
Tsolo				23			1		24
Mount Frere				2					2
Maclear				3					3
Totals	6	3	3	200	16	4	69	1	302

(Sgd.) J. D. BORTHWICK, Chief Veterinary Surgeon.

Office of the Chief Veterinary Surgeon,
Cape Town, 3rd August, 1909.

SOUTH AFRICAN TRADE WITH THE CONTINENT OF EUROPE.

REPORT BY THE TRADES COMMISSIONER.

Mr. Chas. Du P. Chiappini, the Trades Commissioner, writes in a recently submitted report: I have the honour to report the result of investigations on the occasion of my recent visit to Hamburg. My trip occupied from the 18th to the 23rd April and the main object in view was to enquire into the possibility of the further development of markets for the products of the Cape Colony. I also undertook at the instance of some consignees of Cape products in London, especially in the Fruit Trade, to make certain arrangements on their behalf for the distribution of their goods through Hamburg.

The Port of Hamburg.—As shipping facilities play an important part in all matters affecting the expansion of external trade with Continental ports, I devoted much attention to the provisions made for landing freight, for storing goods at the quays and for distribution to various large centres of consumption. It is well known that Hamburg is by far the most important harbour in Northern Europe. It is the great commercial centre for the tade and commerce of Germany, Northern Russia, Norway and Sweden, whilst the influence of its trade is felt as far as Austria. Mr. F. F. Elffe, a member of the Hamburg Chamber of Deputies, kindly conducted me in the Government steam launch through the harbour and explained to me the numerous facilities which exist for the discharge and distribution of goods. I was much impressed with the excellent and modern arrangements. The harbour, which is the great artery of Hamburg, has been described as "throbbing with the quick pulsations of the world's commerce and traffic." The business-like appearance, the noises, the buzzing, and hammering, the whistling and groaning of sirens produced a wonderful impression on my mind. This imposing theatre of the world's commerce with its huge warehouses and endless quays and rows of ships is certainly convincing testimony to the intense commercial activity which is concentrated at this great port.

The free port, which covers an area of 2,508 acres, of which 785 acres are water, is one of the most wonderful achievements of commercial expansion in modern times. It affords every liberty to persons dealing within the limits of the port to land freight without any Customs restrictions whatsoever so long as the goods are not removed inland outside of the boundaries. The warehouses of the free port have the appearance of a large modern city, each group of buildings being replete with every convenience for dealing with a large volume of traffic. Each block is marked with letters and numbers and contains stores and offices for the different classes of trade. These warehouses are so arranged that one side opens on to the quay and the other on to the canals, or adjoining railway sidings. There are over 22 k.m. (over 13½ miles) of stone quays, which encircle the various docks, provided with about 700 fixed and

movable cranes for loading and unloading vessels, about 120 more cranes being erected in different buildings or being attached to them, the greater number of these cranes being worked electrically. On one of the quays is constructed a 150 ton travelling crane, the largest and most powerful of its kind in the world. I cannot now give a full report on what I have seen, but I may mention that at the Asia and America quays 30 sailing ships have been known to be discharging grain simultaneously by automatic lifts. There are also numerous floating docks, amongst them the largest in the world, capable of accommodating a vessel of 17,500 tons.

The Fresh Fruit Trade.—The port of Hamburg offers excellent facilities for the landing and disposal of large quantities of fresh fruit. The fruit-sheds are situated at "Versmannquai" in the "Freihafen" (free port area) and consist of three separate sheds of a total area of about 30,000 sq. met., (= 35,880 sq. yards) and are capable of holding about 300,000 boxes of oranges or apples. Another new shed is going to be built of about 6,000 sq. meters (= 7,176 sq. yards) with an upper storey of the same size. All sheds are light and airy and have heating installation, to prevent the fruit from freezing during the cold weather. These sheds are only being used for whole steamer-cargoes, but parts of sheds are shelved off and are used by the smaller dealers for repacking purposes. The sheds are the property of the *government* of the State of Hamburg, and are rented to some of the leading houses for a lump sum, whilst the smaller consignees have their private arrangements with these lessors and pay them 10 Pfg. to 30 Pfg. (1¼d. to 3⅝d.) per package according to the size, for stocking and loading with two weeks' free storage. The fruit when offered for sale and catalogued is here exposed for the inspection of intending buyers. Fruit arriving in small quantities, such as may be expected from the Cape, is offered for sale at the "Fruchthof" (public auction sale rooms for fruit) after being catalogued and exhibited in the warehouses of the consignees.

Fresh fruit is sold in the first instance almost entirely by public auction. The consignments are carefully sorted under the respective classes, grades and qualities, then catalogued under numerous small and convenient lots, with a picture of the brand, the mark, description, quality and quantity in each lot, and then arranged for the inspection of intending purchasers. I attended the auctions and am satisfied that these are conducted in a business-like manner to the best advantage of both the buyers and the sellers. The auctions are attended by several hundred buyers representing all the towns in Northern Europe. The bidding is brisk and tens of thousands of boxes of fruit are daily disposed off. It appeared to me that collusion or combines between the buyers would be under the circumstances almost impossible, or at all events highly improbable. I was present when some Cape pines were sold and was satisfied with the prices obtained.

The usual commission charged by a fruit auctioneer is 5 per cent. on the proceeds of the sale, which covers wharfage, landing, storing, auctioneer's charges, advertising, cataloguing, and incidental charges. There should be no other charges to the seller excepting that made by his agent if he is not an auctioneer. The buyer pays duty and other charges.

The duties on fruit are:—

Apples and Pears, plain packing	M.3.20 p. 100 kilo.	3/2½	p. 220 lbs.
Apples and Pears, if packed in paper	M.5. ,,	5/-	,,
Peaches and Plums	M.2. ,,	2/-	,,
Grapes and Pineapples	M.4. ,,	4/-	,,
Oranges and Naartjes, etc.	M.3.25 ,,	3/3	,,

In case it is necessary that fruit should be examined owing to disease existing in the country of origin, an extra charge is made of 1½d. per box or 2½d. per cask.

Hamburg is an excellent market for oranges, Almeria grapes, bananas and apples. The trade for pears and pineapples is increasing, but is more limited. Other fruits, such as plums, peaches, and Cape grapes, will only meet with a small demand when arriving during the winter, until they become better known to the trade.

The following figures show the quantities of fruit disposed of at Hamburg during 1908, and will give some idea of the extent of the market. These quantities only represent fruit received from over-sea, and do not include fruit received overland from Italy and Spain, which amounts to about 10 to 15 per cent. of the total received oversea:—

Oranges—1,949,860 cases containing 400 to 800 Oranges.
Grapes—254,134 barrels of about 66 lbs. weight of Grapes.
Apples—139,000 cases—1 bushel boxes.
Pineapples (about) 50,000 cases—8 to 12 pines per case.
Bananas—228,709 bunches.

Shipping Arrangements.—I regret that the means of transport of fresh fruit from the Cape to Hamburg *via* England, are most unsatisfactory. I will make a special effort to improve the conditions, thuogh this will be a very difficult task. I consider this to be one of the greatest drawbacks in connection with the sale of Cape fruit on the Continent. The consignees of Cape fruit in England are at present adopting different routes, none of which tend to enlarge the possibilities of the trade.

The Union-Castle Company and the Royal Mail Steam Packets Company send steamers every alternate Wednesday from Southampton to Hamburg, each Company taking an alternate week, arriving at Hamburg on Monday. The freight is 10/- per ton measurement and the charges for transhipment are 3/- per ton. The fruit thus arrives on the Hamburg market nine days after the arrival of the mail steamer at Southampton. There is a further delay in examination of the shipments and preparing catalogues. The other lines of steamers also sail from London to Hamburg on Sundays, Wednesdays, Fridays and Saturdays, arriving two days after day of sailing. The freights are:—

For Apples and Pears ... ... 10/- per ton.
For Plums, Grapes, Pines and other fruit ... ... 20/- ,,
Lighterage, 3/- per ton with a minimum of ... ... 30/- (All at per ton of 2,240 lbs.).

Another route which has been made use of is *via* Harwich, from whence the General Steam Navigation Co.'s boats sail every Wednesday and Saturday. The freights and charges are about the same as those from London.

It will be seen that by all these routes fruit can only be shipped at the earliest on the Wednesday after the arrival of the mail steamer from the Cape, and by that time the fruit has considerably deteriorated in quality and appearance.

There are also the ships of the American-Hamburg Lines, which afford an opportunity every fourteen days of shipping fruit from Southampton to Hamburg, but this route has also been found inconvenient, as they are irregular in their dates of call.

I called on Messrs. Woermann & Co., the owners and managers of the Woermann and Deutsche Ost-Afrika Lines. They (Messrs. Woermann & Co.) informed me that they would be pleased to accept fruit to

be conveyed in the cold storage of their ships sailing from Cape Town to Hamburg *via* the West Coast. These ships sail about every fourteen days, and the voyage occupies about twenty-six days. The rates of freight for cold storage of fruit are the same as those of the Union-Castle Co. All the steamers unfortunately have not sufficient cold storage accommodation, but advantage should be taken of those which have.

The following are the names of the boats with sufficient cold storage accommodation:—

"Prinzessin"	5,810	cubic feet.
"Admiral"	5,810	do.
"Burgermeister"	1,785	do.
"Prinz Regent"	1,715	do.
"Feldmarschall"	1,715	do.

The dates for sailing for the year 1910 have not yet been fixed, but as soon as they have, particulars could be obtained from the agents in Cape Town.

Maize and Oats.—Hamburg is a particularly good market for maize, though London is at present the better market for oats. Both maize and oats are sold on "Government Certificate" which is final as to quality. The varieties of maize most desired are placed herein in accordance with their value:—

White Flat, if choice, is worth at present about 130 Marks per 1,000 Kilos gross for net, ex-wharf, which is equal to about £6 6s. 6d. per long ton c.i.f.

F.A.Q., of the same variety, is worth about 5 Marks less per 1,000 Kilos.

White Round.—Present price about 125 Marks per 1,000 Kilos.

Yellow Flat, if choice, would be equal in value to the La Plata maize; present price about 122 Marks per 1,000 Kilos.

Yellow Round, F.A.Q.—This maize is very largely used for the distillation of spirits, and is worth about 120 Marks per 1,000 Kilos.

Mixed F.A.Q. is usually worth about the same price as the yellow round.

The weights are the same as those of the London Corn Exchange, namely, for maize, 480 lbs. per qtr., and oats, 304 lbs. per qtr. The freights of the German Line of steamers are the same as those of the Union-Castle Co., namely for maize, 10/- per long ton, plus 1/6, sorting charges, and for oats, 15/- per long ton.

The Harbour charges are:—1 per cent. Brokerage and commission; dock dues, 3 pf. per 100 Kilos, *i.e.*, per 200 lbs.; weighing, 6 pf. per 100 Kilos; Dock rent, 2 pf. per 100 Kilos. Also various petty expenses such as stamps, cost of taking samples, etc.

There is a duty, which is M. 30 for maize and M. 50 for oats per 1,000 Kilos, and is payable by the buyer.

Before closing my report on grain I think it necessary to bring to the notice of the shippers what I consider to be a just complaint which has been laid before me by some of the dealers. I asked one of the largest dealers to write to me upon the subject, and now quote the following extract from his letter which explains itself:—

"Referring to our to-day's conversation I beg to repeat my thanks for your interesting information concerning the exporting trade from South Africa. I would gladly take up this business to a much bigger extent than heretofore if your merchants could see their way to change their present method of doing this trade in some respects, which I would like to explain to you and which I hope you will approve and put before the parties whom it may concern.

"Our list of exporters, which I have shown you, contains the names of 47 firms, of which 24 alone are placed in the city of (   ). Considering the amount shipped during the year from South Africa, this is preposterous, and the result of it is a splintering of the stuff available in many small lots, which, offered through as many different channels in Europe, spoil the market, occasion a lot of unnecessary cable-expenses, and do not allow sellers representative here to obtain the full value, which consolidated offers of a fair amount of stuff in one hand would bring. It is far easier to place 500 tons offered by one firm than 10 lots of 50 tons each offered through ten different firms. You no doubt will find some way to convince the exporting trade in S. Africa that it is to their interest to combine in some way and restrict their offers to a limited number of representatives on this side."

It also appears that a number of produce dealers in South Africa are engaging in rather reckless speculation. From the above letter it will be seen that a very considerable number of small firms are offering to sell maize for the June and July shipments at the time when the crop had not been gathered. It is highly improbable that all these dealers could have secured the maize which they are offering to sell. It should be pointed out that whatever may be the result of the 1909 maize crop in South Africa, it will not materially influence the price of maize on the London and Hamburg markets, and that the S.A. dealers are therefore not in such a good position to judge the future prices of maize as the persons with whom they are dealing on this side. Further, it must be remembered that the South African maize crop is limited, and that over-speculation may lead to disastrous results, and that the seller of Cape or Natal maize must deliver that and no other; and I have been warned by some of the members of the London Corn Trade Association that should there be any failures to fulfil contracts, that a new selling contract for South Africa with severe restrictions will be drawn up by the Corn Trade Association which will be very irksome to the exporters in South Africa.

Wattle Bark.—Though this is not an important article of export from the Cape Colony, it is of considerable importance to South Africa on the whole. On making inquiries I found that Hamburg is one of the most important markets in the world for all varieties of tanning barks and wood. I am informed that out of a total quantity of 15,000 tons of bark annually exported from Natal, approximately 2,000 tons are consumed by Great Britain, whilst the remainder, about 13,000 tons, is either used in Germany or re-exported from there by merchants in Hamburg to Austrian, Scandinavian and Russian tanners. The present price for wattle F.A.Q. is about £8 6s. to £8 15s. per ton of 2,240 lbs. c.i.f. for May and later shipments. The freight 25/- per ton.

Sales are subject to Hamburg arbitration, payment net against documents. Commission borne by the sellers or shippers. The bark should be shipped during the dry season from South Africa, that is, March to May.

Everlasting Flowers.—Hamburg is the most important market for this article. I have on more than one occasion attempted to find a market in England for everlasting flowers, but without success; they are almost unknown on the English market.

Only large snow-white consistent flowers which do not fall off the stem should be sent. A little piece of stalk of about half an inch should be kept in cutting. Small flowers (that is buds) and those of a yellowish and greenish tint are a drug on the market, and quantities of them are now lying at Hamburg practically unsaleable. These qualities ought therefore not to be shipped. They should not be packed too tightly in the cases. Great care should be taken that damp or frost-bitten flowers are not forwarded. These are immediately recognised by the small black

spots which make their appearance on the cup of the flowers. For AI quality prices obtainable are from 5/- to 6/- per kilo. Commission for sale is payable by the shippers.

Berry Wax.—On a previous accasion a consignment of berry wax was sent to Hamburg, but in consequence of the bad management of the consignee or agent it could not be sold, and was sent to Mincing Lane, London, where it realised 50/- per cwt. Since then the article has become better known. A leading firm informed me that they could sell any quantity from 57/- to 60/- per cwt. of 112 lbs. c.i.f., provided the supply was regular. This firm also informed me that they had to refuse orders at this price, as the quantity was not available.

Calabash Bowls.—There is not much demand for calabash bowls in Hamburg, as the Germans are not a pipe-smoking nation, notwithstanding the caricatures one sees of them in illustrated papers. Cigars are cheap and are more generally appreciated. There is, however, a limited market for calabash bowls, and the best quality bowls have been sold at from 9/- to 24/- per dozen, whilst the poorer qualities fetched about 5/- per dozen.

Dried Fruits.—Large quantities of dried fruits, especially Californian are dealt in on the Hamburg market. The varieties for which there is the readiest sale are: Apricots, apples, plums and peaches. The present current prices are:—

Peaches, 26/- to 29/- per cwt.

Apricots, 40/- per cwt.

The prices usually quoted are for "loco Free-harbour, Hamburg," that is equivalent to being "In Bond," the buyers paying duty. The usual method of selling dried fruits is through a reliable broker on samples, and subject to arbitration (concerning quality) of the "Hamburg Waaren Verein," whose decision is final.

The duties on apricots and peaches are: M. 2 per 50 Kilos, and on plums M. 2.50 per 50 Kilos.

Hides and Skins.—Hamburg is good market for hides, but sheep and goat skins are not in much demand.

Cape Wines.—It would be very difficult to create a market for Cape wines in Hamburg, though small quantities of full-bodied Cape wines possessing a special character, such as Pontac and Constantia, have been sold from time to time. There is at present in Hamburg a small consignment of light natural Cape wines of the 1907 vintage, consisting of Sauvignon Blanc and Hermitage. The expert opinions on these wines are that they do not possess sufficient character, nor sufficient body; that they can only be compared with the cheap French wines and are not suitable for the taste of the German people. The white wine is looked upon a little more favourably than the red wine.

The present prices of competing wines are:—

Southern France (Cette), M. 20.
Spain and Italy, M. 15 to M. 20.
Algiers and Palestine, M. 10 to M. 12.

All at per hectolitre, including cask, c.i.f. Hamburg in "Free Port," no duty paid.

These wines are well known to the trade, and are popular with the consumers and well suited for blending purposes, as they are full-bodied and very dark coloured. Even Bordeaux wines are cheap, the present prices for 1907 and 1905 vintages being about M. 21 and M. 25 per hectolitre c.i.f. in Bond.

The new German Wine Law, which will shortly come into force, will impose further severe restrictions with regard to blending of wines, and will further increase the difficulties for the sale of foreign wines.

The duty in Germany on light Cape wines is M.20 per 100 kilos, and the store rent in the Free Port is about 8d. per hogshead per month.

Equivalent Values and Quantities.—For purposes of comparison when reading this report, the following equivalents may be taken:—One Mark (M. 1), equal to 1/- English money; 100 (pf.) Pfennigs, equal to One Mark; 1,000 "Kilos," equal to about 2,200 lbs.; 1,016 "Kilos," equal to one ton of 2,240 lbs.; One English gallon is equal to 4.54 "litres"; 100 Litres equal to One "Hectolitre," or 22 gallons.

List of Firms.—I enclose herewith a list of firms who are already dealing in, or are willing to receive South African produce on consignment for sale.

I have made inquiries about the business standing of these firms, and, while accepting no liability, I consider these firms fit to carry out business contracts entered into by them.

Summary.

In view of the observations made in the preceding part of this report it may be submitted:—

(*a*) That the development of Continental trade in the interest of the Cape Colony and indeed of that of the whole of South Africa, is of considerable importance. In the peculiar circumstances of South African trade with the recurring possibility of congestion in British markets, the advantage of wider distribution at Continental centres is obvious. For example in the Cape fruit trade, but more especially grapes and pears, it would undoubtedly have raised the market prices of these articles in England if there was easy access to the demand which exists for them on the Continent at the time of the year when fresh fruit is scarce on the north of the Equator, and in so far as the citrus fruit trade is concerned, I fear it will be necessary, if we expect to build up a large trade, to take every advantage of the Hamburg market—as this fruit arrives on the English markets at a time when there are lots of other fruits and the demand is consequently not very large.

The future success of the fruit trade, as has been repeatedly pointed out in reports forwarded from this office, depends largely on the number of reliable markets which may be catered for.

(*b*) That Hamburg, in view of its position, port facilities, shipping and storing organisations, is the natural receiving point for certain classes of Cape or South African products, particularly when the present markets catered for are full up; the development of trading relations with that port consequently means the establishment of a regular connection with the whole of Central Europe.

(*c*) In any organisation that may be undertaken to develop outlets for South African products, it ought to be understood that a certain amount of experimental work must be done, and those interested in the export trade must not be discouraged in the event of earlier shipments being in any respect unsatisfactory from the seller's point of view. It is well known that the enormous trade built up in Europe in comparatively few years by countries like Argentina, Canada and the Australian Colonies was met at the outset with most serious obstacles, but those interested in extending the production of their respective countries persisted in the work of exploitation with the results which are now so apparent to all.

This report has necessarily been devoted to the potential expansion of the Cape trade on the Continent, but I may be permitted to suggest that the observations on the whole apply to the export of all the other South African Colonies. In view of the establishment of Union and the large measure in which the other three Colonies are specially interested in the export of Maize, Wattle Bark, Citrus Fruit and Pineapples, it may be advantageous if copies of this report were forwarded to some of the other Governments who may not already be in possession of the information contained herein.

In conclusion, I would like to say that I am much indebted to Mr. F. W. Steege, the indefatigable manager of the Standard Bank at Hamburg, for his valuable assistance and for having introduced me to the several leading firms dealing in South African produce, to whom also I am indebted for the detailed information contained in this report.

The Hamburg Agency of the Standard Bank is a source of great convenience to merchants and shippers trading between South Africa and that port.

LIST OF FIRMS AT HAMBURG WILLING TO ACT AS COMMISSION AGENTS AND BROKERS IN S.A. PRODUCE.

	Remarks.
Arndt & Cohen, Boersenhaus, 4, Adolph Brucke.	General merchants and commission agents; doing a large business with South Africa. All classes of produce.
H. Jungheinrich & Co., Neuerwall, 44.	General commission agents. New Firm. Lived in South Africa.
Fred. Kugelmann, Neueheng, 13.	General merchant and commision agent; specially everlasting flowers, hides and skins, wattle bark.
Gustaf Schonfeld & Co., Kaiser Wilhelmst. 47.	Fresh and dried fruit commission agent.
Aug. Steir, Fruchthof, 8.	Fruit auctioneer.
J. Godenrath & Co., Fruchthof.	Fruit auctioneers.
G. Vogtmann & Co., Glockengiesserwall, 16.	General merchant and commission agent; specially wine.
Adolph Berend, Borsenbrucke, 8.	General merchant; specially dried fruits.
F. F. Eiffe & Co.	General merchants and commission agents
Jacob C. Lafrenz, 1, Schlensenbrucke.	General merchant and commission agent; specially wattle bark, hides, and skins.
Oscar Steidtmann, Gt. Reichenstr., 75.	General merchant and commission agent.
Henry P. Newmann, Schauenburgstrasse, 15/19.	General merchant and commission agent.
Gebr. Keitel, 26, Sandthergnan.	Tobacco brokers.
Georg Westendorf, 1, Alsterdam.	Dealer in all sorts of nuts for producing oil.
Hesse Newmann & Co.	Wool, hides, wattle barks.

SPRAYING FOR APPLE SCAB OR "BLACK SPOT."

FUSICLADIUM DENDRITICUM.

By C. W. Mally, M.Sc., F.E.S., Eastern Province Entomologist.

The apple disease commonly known as "Scab" or "Black Spot" (*Fusicladium dendriticum*) is known to occur in Albany, Bathurst, Fort Beaufort, King William's Town, Komgha, Victoria East, and Stellenbosch Divisions. It was first found in the Grahamstown district by the writer in the spring of 1905. It was no doubt present before that date, but the injury was not sufficient to attract attention. Thus far it has been more destructive in the Collingham valley than anywhere else, no doubt because the conditions of heat and moisture that usually prevail there in the spring are especially favourable to it. The apple known in the Eastern Province as the "Late Bloomer" has thus far been very susceptible to this disease, and unless spraying is carefully done each year the amount of sound fruit is apt to be very small. Other varieties are also affected, some worse than others. The disease is found in and around Grahamstown and seems to be gradually spreading. It will have to be counted as a constant factor in apple growing in the Eastern Province where the early spring and summer weather conditions are, as a rule, favourable to it. In the parts of the country where dry summers are the rule, as in the Western Province of Cape Colony, this disease will not be such an important factor.

In view of the bright future for apple growing in the Eastern Province of Cape Colony, it is important to accumulate results of practical experience in combatting the fusicladium disease. While the results following the application of fungicides in other countries are valuable as indicating the results that may be expected, it is not safe to take it for granted that the same results will be attainable under our climatic conditions.

Through the kind co-operation of Mr. Herbert Wallace, Collingham Valley, near Grahamstown, this Office was able to test the value of Bordeaux mixture under Eastern Province conditions. Because of its susceptibility, the "Late Bloomer" was the variety selected for the test.

Materials Used.

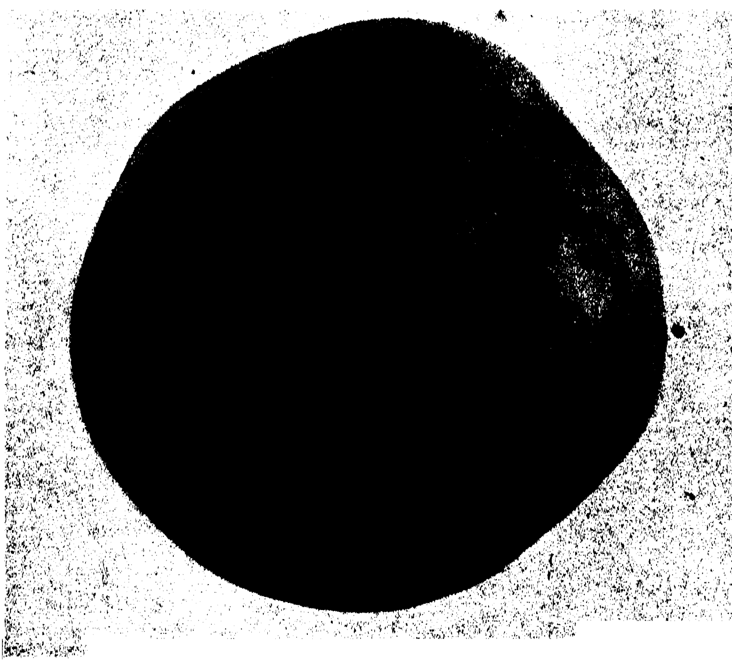
The Bordeaux mixture was prepared according to the following formula; and in accordance with the instructions in the Remedies Chart published by the Agricultural Department, a copy of which may be had on application.

Copper Sulphate, 98 per cent.	6 lbs.
Lime (unslaked)	4 lbs.
Water	50 gallons.

The lime and bluestone were submitted to the Government Analyst, Grahamstown, and he reported that the bluestone contained 1·53 per cent. of impurities, principally iron compounds; and that the results for the lime were as follows:—

Silica	·32	per cent.
Oxide of Iron and Alumina	2·80	,, ,,
Lime	93·20	,, ,,
Magnesia	2·30	,, ,,
Carbonic Dioxide	1·04	,, ,,
Total	99·66	per cent.

It will thus be seen that the materials used were of the best quality.



Apples spotted and cracked by FUSICLADIUM. Specimen from Kent, England, out of a consignment excluded at the port of Cape Town.

The bluestone dissolves very readily in hot water. A wooden or glazed earthenware vessel should always be used for the bluestone.

The lime should be slaked with sufficient water to form a smooth paste free from the "grit" which is sure to be present if it is allowed to get dry enough to be in powder form. This is an important point for the practical man to bear in mind, for even a small amount of grit will greatly increase the work of straining the lime solution and then there is always the chance that some of the gritty particles will find their way into the tank or barrel and from there through the pump to the nozzle where they cause no end of trouble by clogging the small opening necessary to produce a fine spray. It really means all the difference between fairly easy work and unpleasant aggravating delay.

It is also very important to dilute the lime and bluestone solutions before mixing them. If they are mixed in concentrated solution they form a coarse mixture that quickly settles to the bottom of the tank. When made from dilute solutions the mixture remains in suspension very easily and a uniform application from tree to tree is secured. The agitators with which proper spray pumps are provided are quite sufficient to keep the contents of the tank thoroughly mixed. Ample provision should be made so that each ingredient can be diluted to nearly half the full amount. They can then simply be poured into the tank or barrel and enough water added to make the full amount. By using good materials and weighing them off carefully there will be almost no variation in different batches of the mixture. It is always best to test each lot and if there is not quite lime enough, it can still be added in dilute form before adding the last few gallons of water.

Where large orchards are to be treated it will be a great saving to make provision for the convenient handling of the materials to be used so that time is not wasted in going back and forth from the orchard to the water supply. Conditions are so variable that each one will have to study his own needs from the standpoint of convenience. It should be especially emphasized that time is a great consideration in spraying operations, for it takes time to do the work carefully, and where a large number of trees have to be treated allowance must be made for inclement weather and other delays. The aim should be to so arrange the work that the greatest possible number of trees will be sprayed at the proper time. To do this some will be sprayed a bit too early and others a bit too late, unless enough pumps and sufficient labour is available to do the work to good advantage in a comparatively short space of time. An extra pump would be a good investment as a matter of insurance against failure, through force of circumstances, to complete the spraying at the proper time.

Testing the Mixture.

It is a good plan to test each bath of the mixture to make quite sure that the bluestone is neutralized. The most convenient method of testing it is to secure a few ounces of a 20 per cent. solution of potassium ferrocyanide from the chemist and then take a small quantity of the mixture in a white cup and add a drop of the solution. If there is not enough lime present, a dark reddish brown colour will appear. A little more lime (dilute) should then be added, the mixture well stirred and another test made in a few minutes. To learn to recognize even a trace of colour, it is well to take a little of the bluestone solution and add a very little of the lime water, and then add a drop of the testing solution. The colour will appear at once. Then add still more lime water and test again. It will thus be seen that the testing solution will reveal even a trace of free acid.

In the case of the lime and the bluestone used for these tests it was found that four pounds of lime was just a slight excess for six pounds of bluestone. It was not deemed advisable to make a fractional reduction in the lime, for it is best to leave a working margin on the safe side.

Straining the Mixture.

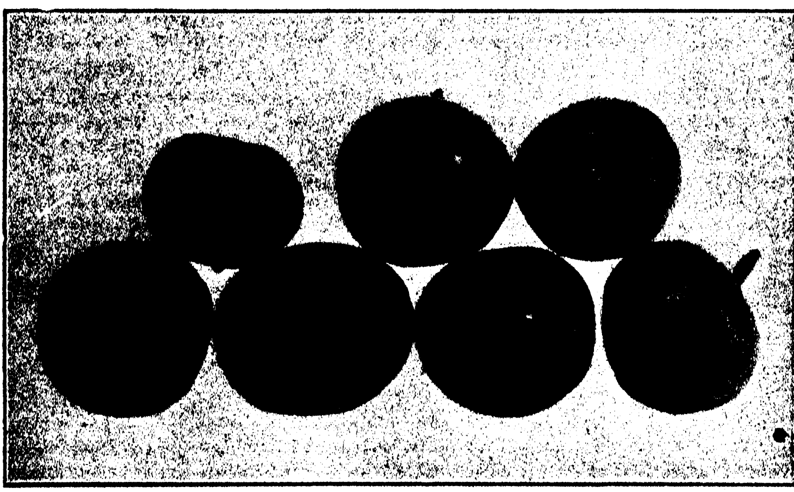
Everything that goes into the spray tank or barrel should pass through a strainer provided with fine brass wire gauze. Gauze about as fine as that used for straining milk serves very well. This insures a grit-free mixture in the pump and prevents the clogging of the nozzles. By using good materials and straining the mixture carefully it should pass

through the nozzles as easily as water. In that way the unpleasantness connected with spraying is greatly reduced.

It is sometimes recommended that the mixture should be strained through coarse cloth or "sacking," but a certain amount of lint is carried along with the solution and in time it accumulates and causes a great deal of trouble by clogging the nozzles, especially when the tank is nearly empty.

THE PUMP.

Perhaps the majority of the fruit growers grudge the money necessary to provide themselves with a good pump. But as a matter of fact they cannot invest the same amount to better advantage. The Eclipse pump was used during the experiments and I would strongly urge everyone who has a number of trees to spray to secure the "Eclipse" or a pump of equal capacity and value. The small hand or "bucket" pump does very well for a few small trees; but as soon as larger trees are concerned it is absolutely essential to have a pump of sufficient capacity to do the work and deliver the spray under good pressure. Unless strong pressure is



Late Bloomer Apples, from Komgha attacked by FUSICLADIUM ; natural size.

secured the spray will not be as finely divided as it should be in any given nozzle and it will also fail to penetrate thoroughly. A coarse "dribbling" spray is not only useless but wasteful as well.

The pump should be provided with a good agitator so that the mixture is kept well stirred during the application. When the pump must stop for a time, the mixture tends to settle at the bottom of the tank. In such case it is a good plan to disconnect the piston-rod and then work the agitator briskly for a few seconds so as to insure a uniform mixture when spraying is resumed. This may seem like a trifle, but it is an important point for the practical man to bear in mind. Unless the contents of the tank are well stirred before resuming work a very strong mixture will be sprayed at first. The remaining mixture as a whole is then very much weaker than it should be. In this way a few of the trees get a mixture very much stronger than is necessary and the others one that is really too weak to be effectual. Failure to observe this point may result in very uneven work and tend to discredit the results as a whole.

The Nozzle.

A Vermorel nozzle giving a fine spray, or a "Bordeaux" nozzle set so as to produce a fine spray, should be used. Where native labour has to be used to a considerable extent, I prefer the Vermorel nozzle, for the reason that there is no chance for variation in its adjustment after cleaning it. With the Bordeaux nozzle it has been my experience that it is very difficult to get boys to adjust it properly after cleaning it. They seldom set it twice alike and hence either get a coarse spray or else a tediously fine spray. They are still more likely to set it quite the wrong way about and get a coarse dribbling spray by having the opening through the nuzzle turned the wrong way.

The nozzles should be attached to an extension rod which will make it possible to reach the top of the tree to good advantage. Without the extension rod the tendency is to direct the nozzle up towards the top of the tree and expect the spray to do the rest. The trees should be thoroughly covered from the tips of the twigs to the ground, and an extension rod is necessary to accomplish that. It is also a help to set the nozzles at an angle of about 15 degrees. The spray then strikes the twigs more nearly at right angles and therefore penetrates to better advantage. It also enables the spray to be directed on to the under side of the lower and larger branches. Otherwise the spray is likely to glance off at an angle and leave a great deal of the bark surface untouched. This untreated surface carries a good supply of spores that will stand a fair chance of reaching some of the fruit. It is a great saving of time to have two nozzles on each extension rod. It is hardly advisable to have more than that unless the operator is very adept in the work. With too many nozzles there is a tendency to waste the mixture by overspraying certain parts of the tree.

Conditions.

The orchard selected for the work is kept under clean cultivation, except in late autumn and winter when plant growth is encouraged as a means of holding the soil against the strong prevailing winds. Over three hundred trees were included in the tests under consideration. They had been carefully pruned and all the brush cleaned away. They had suffered severely from the effects of a very heavy crop and a severe attack of fusicladium the previous season, when over 50 per cent. of the fruit was spotted.

After reserving controls, the trees were divided so as to provide for as many sprayings as might seem necessary, a certain number being reserved from each spraying to serve as controls to show the benefit or otherwise of the additional spraying, or the omission of any given spray.

Fair weather prevailed during August, but after the middle of September and during October showers and moist misty days became increasingly frequent and continued at frequent intervals through the summer. The effect of the weather conditions will be discussed under "spray injury."

Number of Applications Required.

In this climate one difficulty is the very great irregularity in the opening of the buds. In fact, the trees can hardly be said to become thoroughly dormant, especially in certain seasons, for a few of the tips show green leaves for practically twelve months in the year. This not only means that the buds will open irregularly,—see figures 1 and 2,—but that the disease may be more or less active as well besides having the usual winter stage in the fallen leaves. Considerable discrimination is

therefore necessary in selecting the time for applying the spray. If the first application is too long delayed there will be considerable infection ahead of it which will continue more or less throughout the season. If it is too early, the time between that and the second application will be too long and give another opportunity for the opening buds to become infected. If the second application is delayed till all the blossoms have fallen it will be practically too late to save the earlier portion of the crop.

Fig. 1.—APPLE FUSICLADIUM.—To illustrate bud development at time of first spraying. The small tuft of "winter leaves" on twig at left should not be considered in determining time of spraying.

The first spraying was applied September 7th. to 9th. Only a few buds were swelling, as shown in figure 1. The leaves on the one twig are what might be called "winter leaves" and should not be taken into account in judging the time for spraying.

The second spraying was applied September 21st to 23rd. The trees had advanced to the stage shown in figure 2,—some of the buds still practically dormant, others showing colour and others fully open and

considerable leaf growth as shown on the twig in the centre. The small per cent. of blossoms must be disregarded, for the gain from the spraying will greatly outweigh the loss in blossoms. In my opinion this application really corresponds to the after-blossom (second) spraying in America. It is the most important of all under our conditions and unless the work is carefully done a large percentage of infected fruit is sure to appear.

The third spraying was applied October 27th. to 29th. The blossoms had fallen, there was a good show of leaves and the fruit ranged from very small to well advanced.

Fig. 2.—APPLE FUSICLADIUM.—To illustrate bud development at time of second spraying. A few leaves and blossoms, as shown by middle twig, were then out and had to be ignored; the blossoms were injured.

SPRAY INJURY.

Injury from Bordeaux mixture has been recorded from time to time in other countries. Very close watch was kept for any signs of spray. injury, especially since the experience of Mr. W. R. Dewar, late Eastern Province Entomologist, with Soda-Bordeaux was at variance with results reported in other countries. While fair weather prevailed in the early part of the season, the rains were more frequent towards the latter part of October, and during November and early December. Even though it might not be raining, there was often sufficient mist to keep a slight film of moisture on the leaves. Days when farms on the Grahamstown side would be fairly clear the mist could be seen rolling down into Collingham valley. This abundant moisture was favourable to the disease and also increased the likelihood of injury to the leaves from the Bordeaux mixture.

At the time of the third spraying the young leaves that were out at the time of the second spraying—(see figure 2)—showed traces of injury and a small per cent. of them was beginning to drop. The fallen leaves also showed signs of spotting that could hardly be charged to the spray. It is therefore likely that they succumbed to a variety of causes including

the natural tendency to shed a few of the small earlier leaves. The third application was thoroughly made, and in about ten days injury from it could be distinctly traced. The rainy weather continued and by the third week the trees which had received the third spraying could be readily distinguished by the leaves not showing the same healthy colour as those on the trees which had been sprayed only twice. After the first week in December the traces of injury began to disappear and by the middle of January the recovery was apparently complete.

On certain trees the third spraying was only half strength and on others the mixture consisted of equal parts bluestone and lime, to determine whether or not the spray injury would vary accordingly. There was no distinct difference in the amount of spray injury. This agrees with American experience that variation in the amount of bluestone, or the proportion of lime to bluestone, has no practical bearing on the question of injury to the leaves. Rainy misty weather seems to be the chief factor because it produces very tender foliage and fruit and greatly increases the time during which the leaves are covered with a film of moisture which means increased activity on the part of the Bordeaux mixture. The older leaves do not seem to be so easily injured but that is of little practical value because the tender leaves are always present on the tips of the young growth. Besides, the spraying must be done at the right time from the disease standpoint rather than from that of the relative hardness of the leaves. A certain amount of injury to the fruit resulting in "russeting," was observed but it was of no real importance.

Thus far no means of avoiding Bordeaux injury in rainy weather has been discovered; but in the work at Collingham, even though the conditions were favourable to the disease, the first two sprayings gave such good results that the third was of doubtful value especially in view of possible injury to the leaves. Under drier weather conditions the need for the third spraying will be still less because the conditions will then be against the disease and the first two sprayings should give even better results than they did in the present test. Further experiments should be made to fully determine that phase of the work.

It should also be pointed out that foliage suffering from disease that has already established itself is more liable to injury than healthy foliage. Certain young unsprayed trees under observation were suffering from a spot-disease in the leaves. A few of the trees were exposed to the full force of the wind and in these trees the effect of the leaf disease was very much greater. Evidently the leaves had been weakened to such an extent that they responded more readily to the effect of the wind. Had the more sheltered trees been sprayed with Bordeaux mixture it would probably have had an effect similar to that of the wind. In other words, the Bordeaux mixture may act as a terminal influence which completes the work of destruction already in progress.

Spraying is a Preventive Measure.

It should be clearly understood that *spraying with Bordeaux mixture is a preventive treatment* and should be applied before the disease in question gets a start. While it may check the progress of the disease to a certain extent, for practical purposes it may be said that an apple once infected will remain infected. In some cases there seems to be a natural tendency to throw off the disease. This was shown by certain apples that were marked and kept under observation. In a few cases the scabby spots seemed to dry and slough off leaving only a slight flattened rough russety spot. But these were exceptional.

Results.

The beneficial effect of the first and second sprayings was very evident as soon as the fruit began to set.

In the control trees the great majority of the young apples were attacked by the disease and at least half of them dropped off on account of it. At least half of those remaining on the trees by the middle of December, showed the disease, many of them being badly deformed by it. The leaves of the new growth also were rather sickly in appearance, there being a decided difference in favour of the sprayed trees. Towards the close of the season the control trees improved considerably in appearance and some of the worst infected fruit dropped off, so that by the time the fruit was ripe the sound apples on the tree, being larger and more perfect in colour, tended to relieve the situation somewhat as far as appearances were concerned. But I would especially point out that the dropping of the young apples is a very important item because it means a great initial reduction in the crop as a whole. In forming an opinion as to the benefit resulting from the spraying this factor must be considered along with the relative amount of clean or infected fruit at the close of the season. This is especially important during seasons when the show of fruit is light from various causes as was the case in the present instance. Under such conditions the aim should be to save every apple in order that the final yield will be as near the average as possible. If the disease be allowed to develop unhindered the crop will in all probability be reduced below the limit of profit.

The trees receiving only the first spraying showed about 60 per cent. of sound fruit, and the dropping of fruit from the effects of the disease in the early stages was not such a serious item. Trees that received only the second spraying showed about 75 per cent. of sound fruit, the dropping of young fruit due to disease being less than in the case of the first spraying alone.

The trees that received the first and second sprayings showed over 90 per cent. of sound fruit, and almost none of the young fruit dropped because of the disease

The trees that were sprayed three times were practically free from disease, but the spray injury to some extent counterbalanced the extra margin of sound fruit. The russeting of the fruit due to Bordeaux injury was also noticeable but not enough to have any affect on the value of the fruit under our market conditions. There was a certain amount of "russeting" on trees that had not been sprayed. Some of the russeting on sprayed trees must therefore be charged to causes other than spraying.

The irregularity in the blossoming period is noticeable throughout the season. It was therefore impossible with the limited staff available to make daily records of the fruit as it was gathered so as to give anything like exact percentages; but the counts made by the writer show that the estimated percentages given are practically correct.

The trees sprayed with half strength Bordeaux mixture did not make as good a showing as similar trees sprayed with the usual strength but the difference was not great.

The general health of the trees as well as the keeping quality of the fruit was greatly improved. The effect of the spraying is therefore cumulative in so far as it prepares the trees for a better crop the following season.

CONCLUSIONS.

The test just described clearly shows that by careful spraying with Bordeaux mixture the fusicladium disease of the apple can be controlled in our climatic conditions.

Two sprayings,—the first just as the first buds were swelling and the second two weeks later when the first blossoms were opening,—gave the best results. Under more favourable weather conditions, or greater uniformity in the blossoming period, one spraying corresponding to the second in this test may be sufficient, especially if the trees were carefully sprayed the preceding season.

With good materials, a good pump and proper care in preparing the mixture the item of labour and expense is easily within practical limits,—less than a shilling a tree in this case,—which means a very handsome return indeed when considered from the standpoint of an investment. The cost per tree will vary according to size.

Since half strength Bordeaux mixture gives no special advantage from the standpoint of spray injury and shows a smaller amount of clean fruit it is recommended that the mixture be used in accordance with the formula given above.

CAUTIONS.

Bordeaux mixture destroys the blossoms. Therefore trees should not be sprayed while in full bloom. A few trees were sprayed as a demonstration and as a result the majority of the blossoms were killed. Those that survived had probably passed the danger period. In sections where an arsenical poison must be added on account of the codling moth, spraying while the trees are in bloom would also destroy the honey bees.

WORK IN PROGRESS.

Lime-sulphur wash, especially self-boiled lime sulphur wash, is gaining ground as a fungicide and preliminary work with it for apple diseases in America has given encouraging results. It will be tested under the Eastern Province conditions during the coming season. But for the present the fruit growers should follow the lines that have given good results. If the trees are suffering from scale insects it would be well to use lime-sulphur wash for the first spraying and Bordeaux mixture for the second.

The method of preparing Bordeaux mixture recommended by Messrs. Pickering and Theobold in England is also being tested along with ordinary Bordeaux for fusicladium disease in apple and pear and the results will be published in due course.

ACKNOWLEDGEMENTS.

I wish to express my appreciation of the kind co-operation of Mr. Herbert Wallace, "The Orchards," Collingham Valley, near Grahamstown, and of the many courtesies shown me during the progress of the work.

AIDS TO IRRIGATION.

PAPER BY PROFESSOR PAYNE.

At the *Robertson Irrigation Congress, Professor Henry Payne, M.Inst.C.E. and M.I.M.E., read a paper on "Some Aids to Irrigation." He said: Irrigation has been defined as "the systematic application of water to land in order to promote vegetation." If we analyse this definition we see how very comprehensive it is, including—as it does—under the expression "systematic application," the work of the engineer in bringing water to the farm and the work of the farmer in applying it scientifically to the soil for the purpose of promoting vegetation. Four of the main points to be borne in mind when considering water supplied for irrigation purposes are—conservation, distribution, percolation, and evaporation. The streams forming our rivers rely almost solely upon the rainfall, for we have no perennial snows which by their melting will maintain the flow in summer; and since the usual nature of the catchment is barren—owing to the destruction of bush and the constant burning of the grass just prior to the advent of rain—there is little to impede the run-off. If rivers which flowed at a uniform rate existed in this country, the problem of irrigation would be comparatively simple; but South African rivers are intermittent, varying not only from month to month, but also with wide annual variations even in successive years. So that if irrigation, on a big scale, is to be a certainty throughout the year and from year to year, recourse must be had to the surplus of flood water, and means adopted for its conservation on a scale commensurate with the magnitude of any particular scheme. To obtain at least a uniform minimum amount of water throughout the year, large storage dams must be constructed if full advantage is to be taken of the rainfall. The construction of such reservoirs should not prove impossible in most parts of the Colony, for it has lately been put on record that "there is no lack of sites for large storage reservoirs."

Irrigation from Streams.

Irrigation from streams—apart from storage on a large scale—has its limits. For instance, a canal or furrow will only have water during certain months of the year, and this at a time when in all probability the land also is receiving a certain amount of rain. Now, if during the months of heavy rainfall the excess were stored, then the dry season would be adequately provided for, but if storage be not availablt, a time is sure to come when agriculture will suffer from lack of supply during a period when water is wanted; the only means to overcome this serious deficiency is to provide adequate storage by the construction of large dams. Up to the present, conservation of water has played no important part in overcoming

times of drought in this country. In making this statement, it is not intended to under-estimate the value of the individual farmer's dam, but rather to suggest that the storage should be on a scale in proportion to the requirements of the district, the absolute necessity for which will, in all probability, not be fully realised until a season of continued drought comes with its severe practical lesson. For examples of the foregoing point I will first refer to the Nuy and Nonna Rivers and then to the Breede River. The Nuy River irrigation scheme has a weir and measuring device at the entrance of the canal and intake of the pipe line, while the Nonna River scheme has a weir and small reservoir at the intake of its pipe lines; neither scheme has adequate storage. It is true that by means of private storage dams at the farms, the farmers participating in these enterprises have partially guarded themselves against long spells of dry weather, and have added to the value of their property, but to fully develop the properties served by these works far more conservation must be provided than has at present been accomplished. From the lie of the country this should be possible at a reasonable cost. If storage dams be constructed, then more valuable crops could be grown, as water will then be available, not only at the time of the rains, but also during periods of shortage of rainfall, thus benefiting the whole of the lands served by the schemes; some portions of which would otherwise be very indifferently supplied with water. Coming now to the larger example of the Breede River, we find that, generally speaking, for two or three months of the average year little or no flow takes place, while at other periods a very large body of flood water spills over the weir, and thence down the channel to the sea. The rainfall distribution diagram for Ceres shows the variations which occur, and which may—in a measure—be taken as an indication of the river's discharge. When one takes into account the fact that with small rainfall little or no run-off takes place, and that, broadly speaking, the more intense the precipitation on the catchment, the greater is the percentage of the run-off, we see that the fluctuations of flow in the Breede River may be even more eccentric than those of the rainfall as shown on the diagram.

Necessity for Storage.

In an early report on the proposed Ashton Canal, we find that the necessity for storage is emphasised, if it be obtainable at a reasonable cost, as it would enormously enhance the value of the scheme by assuring the supply. The discovery of a suitable site for a dam at Kluitjes Kraal removed the last vestige of doubt which might have existed in regard to the success of the scheme. This dam, if constructed, would store from 1,500 to 2,000 million cubic feet of water, which, if distributed over a dry season of, say, four months, would allow of at least two waterings, each of three inches depth, over 50,000 acres; this would include not only land to be brought under irrigation by the proposed canal, but also that served by existing schemes. Thus agriculture would be materially assisted during the summer months, when nature would be most active, for instance, lucerne could be cut with greater frequency, with a correspondingly big return per acre. Large storage dams for flood waters not only aid the flow of streams from which irrigation canals are taken, but can also be built in situations to catch the run-off in the upper reaches of the dry river beds, so common in this country. Such rivers may have water in the rain district, but they soon peter out before covering many miles of the thirsty soil traversed. Storage reservoirs will here enable the intermittent water supply to be more profitably dealt with than merely as flood waters, and the water thus available will ensure at least one crop per season being brought to maturity, where previously it would have been impossible to do more than start

the growth. A dam in such a position may become dry, but its existence will still be justified, in that it will shorten any period of drought by more effectively distributing the run-off from the intermittent rainfall, thus directly benefiting the farmer. The fixing of a site for a dam necessitates the making of careful investigations by competent engineers, for with the proper choice of site much money may be saved. The selection of the site for the Vyrnwy dam, built in connection with the Liverpool water supply, affords a striking illustration of this point, for had it been shifted only some 200 yards up or down, it would have entailed additional expense of from £300,000 to £400,000. Preliminary borings at the site of a proposed dam, although seeming so useless to the lay mind, will determine the adoption or rejection of a site, as these boreholes show not only the character of the foundation, but also whether or no a natural drain exists below the foundations, which may not be apparent from the geological study of the surface deposits.

Co-operation Indispensable.

Co-operation is indispensable for the construction of large storage dams, not merely because of the expense, but also because the only available site for the dam may be on one farm, whilst the best lands that would be served by the scheme belong to adjoining farms. As the collection of statistics of rainfall and run-off are immensely important when determining the size of any irrigation project, may I put in a plea for greater practical individual interest in connection with the systematic recording of rain gauges and the measurement of streams. To accurately measure flowing water is not an easy task, and is therefore usually left to the engineer, but as success or failure of irrigation schemes or of particular crops may depend upon the quantity of water supplied or used, I will briefly touch upon measurement of water, as it should play an important part in all matters of distribution. The types of notched gauges for determining the discharge of streams as recommended by the Irrigation Department, are illustrated on the accompanying diagrams. The method of gauging the velocity of a stream by means of timing the passage of a float over a given length is probably the only one by which farmers measure the flow in their furrows, care being taken to choose a part of the furrow which is both straight and uniform for some 50 feet. Now, it often happens that this apparently simple condition is not so easy to find in practice. I will therefore draw your attention to a little device for measuring the surface velocity, which is based upon the fact that if a small obstruction be put into a stream, a ripple will form, and when two obstructions are placed side by side a short distance apart, two ripples will result, which will intersect one another at a point down-stream, the distance from the intersection of the ripples to the line joining the obstructions provides the measure of the surface velocity of the stream; the limiting condition is that no ripple will form until the velocity exceeds nine inches per second. The extreme simplicity of applying the idea induced me to construct this small ripple-producing apparatus for the measurement of velocity; it consists of two ordinary 3-inch wire nails placed 4 inches apart on a connecting piece, through which a rod passes for determining the length of ripple. If L be the distance in inches from the intersection of the ripples to the line joining the nail centres, and V be the required surface velocity in feet per second, then V equals 0·40 plus 0·28 L., a range of some 12 inches being sufficient for determining velocities from $\frac{3}{4}$ to 4 feet per second. With this apparatus for determining the surface velocity, it is only necessary to obtain the cross-section of the stream bed or furrow at the place of measurement, which can be found with greater reliability than the cross-section required for the

50 feet length in connection with the float method of measurement. The float is not altogether a satisfactory device, as it is apt to travel to the bank with the slightest breeze present on the water surface, especially is this the case in small furrows, whereas the ripple is merely slightly twisted by a breeze in the short length under observation.

Quantities of Water.

It should be the object of every cultivator to know the quantities of water required for particular crops, as there is usually a figure which will give a maximum return of crop for a given quantity of water, this, no doubt, varies with the character of the soil, there being a narrow range between excess and deficiency. If excess of water be applied to land then there is the danger of reducing the soluble plant foods in the soil, since these will be carried away with the seepage water. If, on the other hand, too little water be applied, and the water in suspension in the soil be reduced to from 5 to 10 per cent. by weight, it will yield none to the plant, and the struggle for existence of the plant may prove fatal. There is a saying that one cannot apply too much water to land provided drainage be adequate. This may be the case in exceptional instances, but usually after a time the farmer who applies too much water will find deterioration of plant life due to removal of the soluble plant foods, and will have to pay for it indirectly by the purchase of manures earlier than otherwise, besides having to pay for the excess of water used by him, in that he is not bringing as much land under irrigation as would be possible with his supply. The amount of watering required for any particular soil can be most easily obtained by noting to what depth a quiet, steady rain has penetrated for the corresponding number of inches of rainfall; and when irrigating the soil the same number of inches of watering, if uniformly distributed, will be needed, if the required depth of penetration has to be the same as that due to the steady rain; or if the depth required be more or less, then the number of inches of watering will be increased or diminished correspondingly. It should be borne in mind that 1 cusec (cubic foot of water per second) will give a 3-inch watering on one acre in three hours, and thus the depth to which such a watering will uniformly penetrate can readily be found for the soil under observation. The laying out of an irrigation scheme should always be accompanied with a drainage system, so that no such condition as absolute standing water should be present in the soil. The drainage being laid so that any seepage water will be either returned to the stream lower down or be available for lower lying lands. The percolation of water downwards and outwards may occupy long periods, and seepage not show itself for some years after the commencement of irrigation. The supply should be regulated so that the high levels of the farm can be watered direct from the channel from the day supply, while the night supply alone should be stored in the farm dams and be utilised for the lower lands.

Evaporation.

Coming now to evaporation, the chief agents are heat and wind, the former aids whilst the latter retards growth. Evaporation is largely due to wind playing over the surface of land and water. On the accompanying diagram I have shown the evaporation which takes place on a water surface—in terms of that taking place during calm under the same conditions of temperature and humidity—against the corresponding velocity of wind; it will be seen that even the light breezes have very considerable

evaporative power. The surface of the land dries under the action of wind, shelter from which minimises evaporation and reduces transpiration from the leaves of plants, thus reducing the amount of water necessary for sustaining their life. Protection can be effected by aid of shelter belts, which may consist of trees, shrub, or hedge. For every foot height of a shelter belt 12 feet on the leeward side fall within the protected zone, so that a hedge 8 feet high will protect about 100 feet of surface against wind action. The direct benefit of shelter belts, beside minimising evaporation from the soil, are the protection of plant and animal life from hot, dry and cold winds, and even from frost; livestock will also be guarded from dust storms, and are afforded shade. Some indirect benefits from the growth of shelter belts are a supply of fuel and poles, a possibility of planting orchards in positions which would otherwise be too exposed, and an increase in the value of land. Service dams should always be guarded against evaporation due to wind. This may be carried out by providing a sufficiently high bank above the water surface. In conclusion, I would impress upon you the need for the scientific utilisation of water in irrigation; it will repay any additional attention involved, and will carry with it prosperity to the community.

PUMPING AND IRRIGATION.

Among the papers read at the recent Irrigation Congress at Robertson was one by Mr. W. Ingham, M.I.C.E., M.I.M.E., on the above subject. After some introductory remarks he said:—

One often contemplates what the position of the Colony would be to-day if the policy of railway construction and irrigation schemes had been carried out simultaneously, and I venture to say that if in the past £1 had been spent on irrigation for every £2 spent in railways the latter would have been a paying proposition to-day. It is deplorable that such schemes as the Kenhardt dam and the Thebus works were ever attempted, for the failure of the Kenhardt dam and the condemnation of the Thebus scheme have put back irrigation in the Colony for at least 15 or 20 years. We can, however, look into the future with far brighter hopes when we see the Prime Minister and other members of the Government taking such an active part in irrigation matters. We have in our present Director of Irrigation an engineer who thoroughly understands his work, and I desire to congratulate the Ministers responsible for having retained his services for another ten years. There is a large area of land in most catchment areas which is of no use for ordinary cultivation, although it would be excellent for tree-planting. The cost of planting is not an expensive matter, say, £5 to £10 per acre, and if judiciously carried out will return a handsome profit if the farmer can afford to wait for several years while the trees are maturing. Afforestation of catchment areas has many things in its favour, a few of which may be enumerated: (1) Decreasing the floods; (2) increasing the dry-weather-flow of the streams. (3) increasing the rainfall slightly, and thereby the total run-off into the river; and (4) reducing sluiting to a minimum. In this country there appears to be some prejudice against the construction of large impounding reservoirs on rivers which carry a large quantity of silt during floods, but this is a matter which can be effectually dealt with if the dam is designed with sluice gates extending the full width of the river. A dam or weir under these conditions is more costly than an ordinary solid dam or weir, but in many cases the cost is not prohibitive, and is the only effective manner of dealing with the silt problem.

Will Pumping Pay.

The answer to this question will depend on the following points: (1) Class of soil; (2) class of crop; (3) kind of plant adopted; (4) length of delivery pipe; (5) height of lift; (6) cost of fuel; and (7) nearness of railway if produce is sent off the farm. Good soil is usually found to some extent in the valleys of all South African rivers, and in nearly every case it will pay to pump where lucerne or certain root crops and fruit trees can be grown. On the other hand, it may be taken as an axiom that it will not pay to pump for cereals. With reference to lift, 150 feet should be taken as a maximum, and the annual costs for interest, depreciation, repairs, fuel, oil, waste and attendance should not exceed from 4s. to 6s. per 3 in.

or 4 in. watering per acre, according to the crop grown. With lucerne the quantity required will be from 24 to 30 inches per acre annually, and presuming that five or six crops are obtained, the cost, according to different climatic conditions and soil, will vary from 20s. to 30s. per acre annually. Seeing that lucerne will give a gross return of from £16 to £18 per acre if sent to market, or a net profit of from £10 to £12 after deducting all working expenses, I need not waste time in proving to you the desirability of erecting pumping plants for this purpose, taking it for granted, of course, that a gravitation scheme is unsuitable for the site in question. If high-class ostriches or dairy cows are fed on the farms, then the gross return will be nearly doubled.

Cost of Schemes.

In this country it may be taken that even under the very best conditions it will not pay to put land under water if the cost of the work exceeds £20 per acre. In the majority of cases, £10 will be found a reasonable sum, although many excellent works have been carried out for from £3 to £7 per acre. The average of South African works up to about five years ago was between £13 and £14. It must not be overlooked that it may be cheaper to put down a pumping plant if a suitable site presents itself rather than going in for an expensive gravitation scheme, with long furrows to maintain. It is simply a question of comparing the original capital cost of the works or plant and that of the capitalisation of the working costs in both schemes. For instance, suppose the gravitation scheme costs £2,000, and the working costs are £100 per annum, the latter amount capitalised at five per cent. is £2,000, making a total of £4,000. The pumping scheme costs, say, £600, and the working expenses are £200 per annum, which, capitalised at five per cent., is £4,000, making a total of £4,600. Other things being equal, it is better to go in for the gravitation scheme. On the other hand, if the pumping scheme costs £4,600 and the gravitation scheme, owing to expensive head works and a long furrow, works out at, say, £6,000, then the pumping scheme is preferable. If the cost is equal, choose the gravitation scheme, presuming, of course, that your works will not be endangered during large floods.

Charcoal.

Owing to the increased use of charcoal for suction gas plants, and the removal of trees and bush for its manufacture, it may be necessary in the near future for the Government to consider the advisability of making certain regulations as to replanting in order to avoid the denudation and formation of sluits, which must necessarily follow. The price of charcoal made on the farm will be from 5d. to 1s. per 100 lb., whereas, if purchased from the Government or private manufacturers, the price will be from 1s. to 2s. per 100 lb. The making of charcoal can be carried out in a very simple manner by coloured labour, and the cleaning of land of bush and trees can often go hand in hand with its manufacture, thus paying for the cost of clearing the land to be put under irrigation. It is not advisable to use all the material which comes out of the charcoal pit, and it will well pay the manufacturers if the smaller stuff is thoroughly cleaned and screened. I understand that sawdust and mealie cobs can also be used for fuel in suction gas plants. Ram pumps, driven by oil engines, are desirable for high lifts, and the motive power can be transferred from the engine by either belt or friction clutch. The latter is most convenient, and the extra cost is only from £10 to £15 for engines developing from 10 to 20 brake horse-power. If the plant should be designed without a friction clutch between the engine and pump, it will be desirable to have fast and

loose pulleys for the belting, so that the engine can be started without the pumps. Oil engines cost about £16 per b.h.p. when developing 10 to 12 brake horse-power, and £12 per b.h.p. for from 20 to 25 horse-power. An 8-inch treble ram pump with friction clutch and 10½ brake horse-power oil engine will lift 12,000 gallons per hour 100 feet high, and costs about £360, or £30 per horse-power, not including concrete foundation, fixing and galvanised iron building; these will add on another £30 or £40 to the cost, or, say, £400 altogether. A centrifugal pump for doing the same work on a 50-feet lift as the ram pump already mentioned would cost £50 for the pump and £180 for the engine, and, say, £30 for housing and foundation, making a total of £260, as compared with £400 for the ram pump plant. The efficiency of centrifugal pumps is about 30 per cent. less than ram pumps, and, moreover, it is undesirable to fix single centrifugals for heads of over 50 feet, although high lift or multiple centrifugal pumps have been adopted on lifts up to 1,000 feet. A very handy form of portable pump has been designed by Messrs. Hathorn, Davey and Co., of Leeds. It is a combined petrol motor and centrifugal pump, mounted upon a spring cart, and can be moved about from plot to plot. The cost varies from £135 for 120 gallons per minute, lifted 30 feet, to £200 for 600 gallons per minute, lifted 10 feet, and includes 15 feet of flexible armoured suction hose, foot valve and strainer. Noria or bucket pumps worked with horses or oxen can often be used with advantage for low lifts. The Aqua-Thruster or Pulsometer type of pumps are very handy for temporary purposes, but should never be used for permanent irrigation owing to the heavy cost for fuel. Of late years helical centrifugal pumps have made great headway, and they appear to have their greatest efficiency (83 per cent.) on a 36½-feet lift, when running at 788 revolutions per minute, and the efficiency gradually decreases to 59 per cent. on a 110-feet lift and 1,290 revolutions per minute. The helical centrifugal has a greater efficiency than the ordinary type of centrifugal pump, and can be used on higher lifts; the cost is only from 5 to 10 per cent. more than the ordinary type, and is in many ways preferable. Low head turbines and hydraulic rams can be used with advantage where a fall of over 5 feet can be obtained, and Pelton wheels are suitable for high falls up to 2,000 feet. Windmills are useful for raising water for stock purposes and for irrigating small plots of land from 5 to 20 acres in extent, but they are not adapted for watering large areas. Within the last few years a new plant has been placed on the market and is well worthy of consideration by farmers. It is known as the

Suction Gas Plant.

The gas is made from charcoal, anthracite coal, or coke in a generator, and passed through a scrubber to clean it before entering the engine, the gas being fired by magnetic ignition. When the plant is cold it takes from 20 to 30 minutes to start, according to the class of place and fuel; but when the fire is banked overnight it can be started in about ten minutes. The official report on the trials made of suction gas producers under the auspices of the Royal Agricultural Society at Derby, in June, 1906, shows that the undermentioned fuel and water consumption may be expected with a good suction producer plant when working continuously and under the best conditions: Anthracite: Full load, 1 lb. per b.h.p. hour, including fuel needed for starting and for banking during the night; half-load, 1.6 lb. per b.h.p. hour, including coal for starting; 1 gallon of water is required per b.h.p. hour at full load, and one-quarter gallon at half-load; coke, full load, 1.3 lb. per b.h.p. hour, including fuel needed for starting: 1½ gallons per b.h.p. hour at full load. Charcoal was not used in the above

tests, but this fuel gives the cleanest gas, and from 1⅓ to 1¼ lb. are required per b.h. power hour, when working under conditions, although I understand that as low as 1 lb. has been obtained. The method recommended when designing a pumping plant is as follows: Find the actual horse-power required based on the quantity of water lift, friction in pipes, etc., then add 20 per cent. for engine in efficiency. Double this horse-power owing to efficiency of centrifugal pump being only, say, 50 per cent., add 20 per cent. for constant load factor, and a further 3 per cent. per 1,000 for elevation. When designing a gas plant the atmospheric pressure at the site where the plant is to be erected has to be taken into consideration, and it is usual to allow an increased power of 3 per cent. per every 1,000 feet elevation above ordinary sea level. Roughly speaking, for every 2,000 feet elevation the atmospheric pressure is reduced by 1 lb. per square inch, or 2.33 feet head of water. In practice, however, it will be found desirable to reduce the theoretical head by one-third, and it may be taken as an axiom that the nearer you can place the pump to the water the better, so long as it is out of the range of floods. To show the comparative fuel costs per acre, three inch watering, with different classes of engines, the following table has been worked out, and it will be seen that the suction gas plants are easily first:—

Suction gas, Natal anthracite, 10¼d.

Suction gas, charcoal, 4½d.

Oil, paraffin, 2s. 5½d.

Steam, coal, 1s. 11½d.

Steam, wood, 1s. 5½d.

A 20-b.h.p. engine with centrifugal pump will lift 5,000 gallons per hour 30 feet high, or 500,000 gallons per 10-hour day. If we therefore allow a 3-inch watering per acre, say, 68,000 gallons per acre, the above plant is capable of watering about 7 1-3 acres in 10 hours, and this cost is shown in above table. The cost given above is for fuel only, and other working expenses, sinking fund and interest, based on the life of the plant, must be taken into consideration when the total annual cost per acre is required. It would also be advisable to add from 10 to 20 per cent. to the above prices for loss of water due to absorption, evaporation, etc., between the pump and the crops, as so much more water will be required to be pumped. It may not be generally known that the Government of Cape Colony are providing loans for irrigation purposes on a 3½ per cent. basis, and that particulars are appended. For pumping plants the re-payment is allowed on a 10 years' basis; that is, for every £100 borrowed the farmer has to pay £11 18s. 10d. for redemption and interest per year for 10 years, whereas if cash had been paid for the plant without taking advantage of the irrigation loans, the farmer would have paid 6 per cent. for his money, and the total even at simple interest would have been £400, plus £240, equals £640 during the same 10 years' period, or £162 more.

PREPARING WOOL FOR MARKET.

DOES IT PAY TO SHIP?

The Secretary of the Whittlesea Farmers' Association forwards the following report, read at the last meeting of that body by Mr. B. T. Price, with a request for publication:—

I have much pleasure in submitting to you the report of my clip of 85 bales of wool which was placed in the hands of the Government Wool Expert, Mr. McKee, to be properly got up for market, as a demonstration as well as a guide to farmers, to prove whether it pays to skirt, roll and pack fleeces separately. Now, gentlemen, I had the clip offered in East London towards the end of February last, when there was an offer of 6¾d. for the clip, which was refused, but the 18 bales of broken skirts and locks were sold at the following prices:—

7 bales broken fleeces at 5½d. per lb.
9 bales skirts at 4⅛d. per lb.
2 bales locks at 1d. per lb.

The clip was then shipped, and upon arrival (after the close of the March sales in London, which closed with a rise of ½d. per lb.) was valued at the following prices:—

17 bales hoggets sup. cmbngs., 8½d. per lb.
16 bales wethers sup. cmbngs., 8d. per lb.
8 bales 1st ewes sup. cmbngs., 7¼d. per lb.
24 bales 2nd ewes sup. cmbngs., 7½d. per lb.
2 bales show wool sup. cmbngs., 8d. per lb.

The wools were brought forward on the May sales (which also opened with a rise of ½d. per lb.) and were offered on the 12th May and sold at the following prices:—

17 bales hoggets sup. combings, at 9d. per lb.
16 bales wethers sup. combings at 8½d. per lb.
8 bales 1st ewes sup. combings at 8d. per lb.
24 bales 2nd ewes sup. combings at 8d. per lb.
2 bales show wool sup. combings at 9½d. per lb.

Now I have lumped the clips together, and the results pan out as follows after deducting all charges, viz.:—

67 bales (without skirts, etc.), 7⅜d. clear in East London on the skirted clip, or

Eighty-five bales (the whole clip) 6⅜d. clear in East London. I have got the account of sales of Mr. S. R. Haye's clip, which was sold in East London in February last at the net price of 6$\frac{1}{16}$d. per lb., unskirted. This was without the rise of 1d. per lb. in which my clip benefited, and if deducted from my clip will bring it down to 5⅜d., so that according to the results of my clip it was only worth 5⅜d., when Mr. Haye's clip was sold, leaving a difierence of 1$\frac{5}{16}$d.

Now this is the third season in succession that I have skirted and shipped my wool and have always come off with ½d. to 1d. per lb. to the bad, the present clip being 1 d. per lb. below unskirted wools. Of course, I do not want you to run away with the idea that it does not pay to skirt, but I have come to the conclusion that while our wools are catalogued as South African grown, we will never get to within 3d. per lb. of Australian wools. The name South Africa is enough to condemn any clips.

I should like to see a few bales of Australian best wool brought out to the Cape, and sent on from here and sold as Cape wool on the London sales, and I feel sure the result would be 3d. per lb. less than if sold as Australian. I have found that only 20 per cent. of the wools grown in Cape Colony are offered on the London sales, so that the other 80 per cent. are sent direct to the manufacturers, hence very few of the best clips are offered in London. It is my opinion that on account of this the buyers never look for any good Cape wools on the London market, and therefore any good clips are sacrificed.

I should very much like to see a market opened in America for Cape wools, as I am convinced that our wools would do better there than in London. Another thing that surprises me is that in most instances wools only realise what the broker values them at with any rise or fall that occurs in the sales when the wools are offered, hence it appears that buyers are guided by the brokers' values.

I believe that the sales now organised by the Chamber of Commerce are going to be very beneficial to Cape wool-growers, but I don't hold with the excessive commission of 1¾ per cent. together with 1s. per bale for handling. The old charge of 1 per cent. together with the 1s. per bale I think would be ample.

Copy of letter from Chas. Balme and Co., Brokers, London, who sold Mr. Price's clips:—

London, 14th May, 1909.

Dear Sir,—We last wrote you on the 3rd April. Since that date, we are glad to say, wool values have further improved, and at our sales which are now in progress we have a strong market for all classes of staple. The advance is in great measure due to the strength and volume of the American demand for the better description of greasy wools, which are now selling at very full rates. Cape shipments have not fully participated in the advance; quotations, however, for combing wools such as yours stand quite 5 per cent. higher than in March.

In our sale of the 12th inst. we brought forward your shipment per *Galician*, and enclose herewith an extract of the catalogue showing the prices realised. We are glad to say that the wools met with an excellent reception from the trade, and that the results obtained fully reflect the improvement in the market to which we have referred above.

In entering the produce in the catalogue we drew attention to the fact that you had taken special care to avoid loose jute, and also that the wools had been classed by a Government expert. Your clip this season is well grown, but carries a large percentage of yolk waste and the back of the fleece is earthy. The hoggets are of long staple and good quality and sound; the wethers not so deeply grown, but rather lighter in grease. The first ewes are of fine quality, rather yolky; the second ewes not so fine a quality. The show wools are long, sound, of good quality, but yolky. The fleeces have been well skirted and graded for quality, the distinctions between 1st and 2nd ewes, although they fetched the same price, being well defined. The manner in which the flock has been prepared for market is distinctly satisfactory, and the Government Inspector's scheme of a suitable classification for Cape wools is in our opinion, a very good one.

We notice that the results obtained for your clip this season are largely in excess of those realised on the 12th October last, and further, that they compare very favourably with the price offered for the wool in the Colony. We remain yours faithfully,

(Signed) C. Balme and Co.

A DAY WITH A "DOWSER"

WATER DIVINING IN ENGLAND.

For the first time in my life (writes a contributor in the *Manchester Guardian*) I have seen a man discover water fifty feet underground, in a ploughed field, after walking about for an hour and holding in his hands a little forked twig of whitethorn. He is what is called a "water diviner," though the old-fashioned term is "dowser." It is said that there are not a dozen men in the whole of the country who have this faculty, and it is a singular thing that nine or ten of them hail from Wiltshire. The diviner I met was a Wiltshire man, though for the last eight or nine years he has been living in Huntingdonshire, where he owns and works a farm of a thousand acres. He has been finding water for twenty years, and has travelled not only through the whole of England and Wales and Ireland, but was asked to go to South Africa to pursue his calling. In one of the very driest regions of Africa he discovered water after the local authorities has spent £7,000 in futile borings.

Until I met him I was rather sceptical. I had read the subject up, and the fact that the local Government Board refused to allow local authorities to spend public money in fees to water-diviners strengthened my natural disbelief. On the other hand, there was the fact that in a score of cases —nay, hundreds, water had actually been discovered by these diviners, and the published testimony of men like Lord Salisbury, Lord Lansdowne, Lord Selborne, Sir Henry Harben, Sir Edward Fry, and others that they had employed water diviners and been quite satisfied with the discoveries made could not be over-looked. All the same there lingered in my mind a feeling of doubt, a wish to see for myself, to cross-examine the diviner and scrutinise his methods; and hence an invitation to watch the Huntingdon man find water was too good an opportunity to be lost.

The estate which was the scene of operations belongs to a peer who has possessions in three counties. His chief agent is a member of the County Council, and was formerly an inspector under the Board of Agriculture—a shrewd man of the world, not at all likely to be taken in by claptrap or chicanery. He had employed the water diviner exactly a dozen times before the present occasion, and in each instance water had been discovered on the spot indicated. "Once," said the agent, "I thought he had failed me. We bored 50 feet deeper than he had told us and found nothing, so in dispair I gave it up and ceased boring. We covered the hole up. Six months later I took off the boards and looked casually, and found the place full of water. We began using the water, and the yield has never failed us since. We must have bored a few inches out of the line he had indicated, and so missed the spring, but later the water broke through the shallow earth and filled the hole. Since then I have had the most complete confidence in him, and should never think of building property where water is wanted without first taking his advice."

In the present instance the agent was going to cut up part of a big farm and provide two small holdings under the terms of the recent Act. He had staked the land out and marked the site of the two cottages, but it was then seen that there was no water supply within a mile, where a corporation main passed along the high road. To purchase water from the main meant expense, and to lay the necessary pipes meant further expense, and it was to see whether a nearer supply on the estate could be found that the diviner was sent for. He was told what was wanted, and he at once set to work. He removed his overcoat, put on a cap, took a small forked twig of whitethorn, and began walking over the field. He held the twig so that a fork rested in each hand, and the junction pointed downwards. He tramped at a vigorous pace all over the field, now in circles, then in diagonal lines, then backwards and forwards in his own tracks until he was some hundreds of yards away from the site of the proposed buildings. Finally he reached the hedge dividing this field from another. "This will never do," said the agent; "we want the water here, not yonder. If he finds it in yon field it will be 400 yards away, and we should have to lay pipes. If he can't find in this field we must alter our plans altogether." So we followed the diviner and took stock of the situation. He told us the field was as dry as a bone. There was no water anywhere, except in the corner near the hedge, and that seemed to him like a very small stream which came into this field from the next, but lost itself as though in a sponge. Remembering that the field was absolutely bare, with no vestige of water anywhere, it seemed almost uncanny to hear a man talking about under-ground springs in this positive manner. He suggested to the agent that he should go through the hedge and try the next field. "Very good," said the agent, "but if you find water there I shall have to alter the site of the houses and bring them there."

The diviner now entered on the second half of his work. He tramped the whole of the ploughed field, and as the earth was soft and lushy it made walking very heavy. He appeared to have a clearly defined idea of what he was doing. He stood in one spot a moment or two, and then he walked steadily away; then he came back and walked on another line of his own; and then, for a third time, he came back and started on still another line. All the time he was intently looking at the ground. He never hesitated, never seemed lost. He walked at a rapid pace, as though he knew where he was going to, and it was quite clear he was making discoveries. Finally, after he had been at work an hour and ten minutes, he called us to him. We went to what I will call the converging point, and there, indicating a spot on the dry earth about ten yards from the hedge, he said, "There is water there. It is about fifty feet deep, and I estimate the yield at about 3,000 gallons a day. There are three distinct streams of water beneath this field. I have tracked them all. They converge here, where there is a well, or spring-head. There is a slight overflow from here, and it passes underneath the hedge and into the next field, but it is very small, and it soon loses itself and cannot be traced. You will be all right here. Sink a well, and you will have 3,000 galons a day." He and the agent spoke of it in the most matter-of-fact way, as though there was nothing peculiar in a man saying he had found water when there was no external sign of it and nothing in the figuration of the land to indicate it. The agent, indeed, took it for granted, and at once called his assistant and told him to have the boring plant at work in a few days, and meanwhile to cancel the site in the next field and have the cottages for the holdings built here. They laughed at my look of amazement. "There is no doubt about it at all," said the agent; "if he's been right twelve times, why not the thirteenth?"

At my request, the diviner did the whole thing over again for me. I have said there were three distinct streams. We walked to the beginning of one, and as soon as we reached it the twig in his hands started moving. He held it pointing to the earth, but as he walked along the course of the stream it gradually rose up until it was horizontal, with the angle of the fork pointing to the spring-head. As we neared this point, the twig rose higher and higher until it was vertical, pointing upwards, and a moment later, when we stood over the head of the spring, it actually twirled round and round in his hands with just the same action as that with which a child twirls a skipping rope. We walked over the whole three water-courses, and in each case the result was the same—at first the twig pointed downwards, then it rose, until it went round and round as we stood over the spring-head. I took hold of it in his hands and felt the force which moved it. He himself could not arrest it, and when he asked me to do so I gripped it tight and it wrenched itself out of my hand. A second time I gripped it, while he held it quite loose, and this time the twig snapped. To show me that any twig would do he cut a small branch of thorn from the hedge, and as soon as he stood over the spring-head it twirled just as the other had done. When I held it there was no motion at all, but as soon as the diviner put his hand on it I felt the twig begin to move upwards. To my mind the thing was beyond suspicion. The diviner had some power, some faculty, which made his body sympathetic to the presence of water, and as soon as he came in contact with it the influence was communicated to the twig. He said he could tell the presence of water without the twig, but the latter was necessary to enable him to follow its course and to know when he reached the head of a spring. Moreover, the pressure exercised by the twig gave him an idea of the depth at which the water was situated, and also of its volume.

From henceforth I, at any rate, am a confirmed believer in the divining rod of the water finder.

E.P.

SORTING POTATOES IN THE TRANSVAAL.

The following correspondence is published for general information:—

P. J. du Toit, Esq., Under Secretary for Agriculture, Cape Town.

SIR,—I have the honour to enclose the latest regulations issued by the Transvaal Department of Agriculture relating to the importation of consignments of Potatoes into the Transvaal.

As these regulations come into force from the first prox. I think it would be advisable to draw attention to same throughout the Cape Colony in every way possible, and particularly so in the next issue of your *Agricultural Journal*, so as to obviate loss and disappointment to your Producers as much as possible.—I have, etc.,

(Sgd.) A. WEBB.

Parker's Buildings, Johannesburg, July 31, 1909.

Transvaal Department of Agriculture,
Pretoria, July, 1909.

RESORTING OF POTATOES AT JOHANNESBURG.

SIR,—I have the honour to inform you that the important question of the resorting of consignments of table and seed potatoes which are imported into the Transvaal from Natal, Cape Colony and Orange River Colony, as well as from oversea, has recently received our serious consideration, and the following scheme has been formulated, principally for the purpose of enabling our farmers to procure large quantities of seed potatoes free from disease.

1. All consignments of potatoes which are imported from oversea or from neighbouring Colonies will be inspected upon arrival in the Transvaal at Volksrust, Vereeniging and Christiana, and if found to be free from insect pests and plant diseases will be immediately forwarded to their destination, but if found to be infested with any disease the consignors or consignees will have the option of having such consignments despatched to Johannesburg at their expense for the purpose of being sorted there under the supervision of our Plant Inspectors. A charge of 6d. per case or bag will be made in order to cover the actual cost of resorting the potatoes.

In the case of seed potatoes in full trucks intended for Johannesburg and Pretoria, such will not be detained at the border stations, but will be examined upon arrival at destination.

In the case of consignments of seed potatoes from oversea if the consignors or consignees are not desirous of paying such charges, the consignments will have to be destroyed at the border stations within four days after arrival, as the other colonies,* and also the Government of the

*It should be noted that such legislation has not been enacted in Cape Colony.—Ed. A.J.

Province of Mozambique, have recently enacted legislation to the effect that such consignments which contain a certain percentage of disease must not be reconsigned out of the Transvaal.

2. All consignments of potatoes which are found upon arrival to be infected with Scab (*Chrysophlyctis endobiotica*, Schil.) will not be resorted, but will be destroyed immediately upon arrival in the Transvaal and a copy of Government Notice referring to this disease is attached for your information.

3. The Director of Customs has agreed to assist us in this matter, and all importers of potatoes must obtain a sorting order from the principal Customs Office at Johannesburg, between the hours of 9 a.m. and 3 p.m. each day, and all moneys must be paid into this office for such work.

4. It must be distinctly understood that it will be impossible to have any consignments of seed or table potatoes re-sorted at the border stations, viz.: Volksrust, Vereeniging, and Christiana, on account of the fact that we have only one Inspector at each of these stations, and his time is fully occupied with the ordinary work of fruit and plant inspection.—I have, etc.,

(Sgd.) F. B. SMITH,
Director of Agriculture.

GOVERNMENT NOTICE NO. 646 OF 1909.

It is hereby notified for general information, that His Excellency the Governor has, under the powers in him vested by Section 1 of Ordinance No. 16 of 1904, been pleased to make the following additional Regulation for preventing the introduction and spread of insect pests and plant diseases in this Colony.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 9th June, 1909.

REGULATION.

On and after 1st September, 1909, no person shall introduce into this Colony from outside South Africa any consignment of potatoes unless accompanied by a certificate from the consignor stating fully in what country and district of that country the potatoes were grown, and also a certificate from the Board of Agriculture of the country in which the potatoes were grown, to the effect that the disease known as warty disease or black-scab, caused by the fungus *Chrysophlyctis endobiotica*, Schil., has not been declared to exist in the district from which the potatoes come. Any consignments not accompanied by such certificates will be liable to be seized and destroyed by the Department of Agriculture.

CAPE PRODUCE CONDEMNED IN THE TRANSVAAL AND RHODESIA.

Return of Vegetable Produce from Cape Colony, condemned by Transvaal Plant Inspectors at Johannesburg and elsewhere during the month of May, 1909.

POTATOES.

May 27.—J. H. Coetzee, Drew, 10 packages, Eelworm, 20 per cent.
May 10.—De Wet, Tarkastad, 40 packages, Phytophthora infestans, 15 per cent.
May 27.—H. Glennan, Worcester, 30 packages, Eelworm, 15 per cent.
May 26.—Goods, C.S.A.R., Burghersdorp, 1 package, Nectria Solani, 1 per cent.
May 21.—Knight & Co., Dordrecht, 36 packages, Nectria Solani, 5 per cent.
May 26.—Knight & Co., Dordrecht, 18 packages, Nectria Solani, 2 per cent.
May 29.—Levy, Sterkstroom, 140 packages, Eelworm, 15 per cent.
May 27.—A. C. May, Cape Town, 30 packages, Nectria solani, 2 per cent.
May 8.—Moram Bros., Tarkastad, 57 packages, Phytophythora infestans, 20 per cent.
May 29.—Quail Bros., Molteno, 27 packages, Eelworm, 15 per cent.
May 29.—Slessing, Elliot, 17 packages, Eelworm, 15 per cent.

APPLES.

May 5.—S. Cotzias, Vlottenberg, 16 packages, Codling Moth, 2 per cent.
May 1.—V. Naidoo, Wellington, 12 packages, Codling Moth, 1·6 per cent.
May 7.—Pickstone & Arton, Groot Drakenstein, 67 packages, Aonidiella aurantii, 7·5 per cent.
May 25.—Pickstone & Arton, Groot Drakenstein, 196 packages, Aonidiella aurantii, 6·75 per cent.
May 25.—Pickstone & Arton, Groot Drakenstein, 130 packages, Aonidiella aurantii, 6·75 per cent.
May 1.—J. Sarembock, Huguenot, 30 packages, Codling Moth, 1·2 per cent.
*May 1.—Mrs. Scott (Passenger), 1 package, Codling Moth, 10 per cent.
May 3.—J. Shapiro, Huguenot, 16 packages, Codling Moth, 1·4 per cent.
May 21.—J. Shapiro, Huguenot, 6 packages, Codling Moth, 1·2 per cent.
May 7.—Western Fruit Supply, Worcester, 10 packages, Aonidiella aurantii, 6 per cent.

ORANGES.

*May 28.—D. W. Ballot, Oudtshoorn, 12 packages, Citrus Rot, 6½ per cent.
May 3.—Bathurst Farmers' Union, Grahamstown, 4 packages, Red Scale, 5·2 per cent.
May 26.—Bathurst Farmers' Union, Grahamstown, 10 packages, Red Scale, 8 per cent.
May 26.—Mitchell, Cotts & Co., Port Elizabeth, 3 packages, Red Scale, 8 per cent.
May 18.—Groot Drakenstein Vineyards Co., Paarl, 19 packages Lemons, Red Scale, 7 per cent.
May 18.—J. Schwartz, De Doorns, 9 packages Quinces, Codling Moth, 2½ per cent.

All the above were reconsigned with the exception of those marked *, which were destroyed.

Return of Vegetable Produce from Cape Colony, condemned by Rhodesian Plant Inspector at Salisbury during the month of March, 1909.

*March 4.—Hyatt, Cape Town, Apples, 14 cases, Codling Moth.
March 11.—Meikle Bros, Apples, 15 cases, Codling Moth.
March 18.—Meikle Bros., Apples, 10 cases, Codling Moth.
*March 30.—Naidoo, Robertson, Apples, 2 cases, Codling Moth.
*March 11.—Rabinowitz, Stellenbosch, Apples, 16 cases, Codling Moth.
March 4.—Rabinowitz, Stellenbosch, Peaches, 7 cases, Ceratitis capitata.
March 15.—H. C. Veltman, peaches, 15 cases, Ceratitis capitata.
*March 8.—Russell, Mafeking, Quinces, 4 cases, Codling Moth.
*March 9.—Naidoo Robertson, Pears, 7 cases, Codling Moth.
March 3.—Gowie, Worcester, Potatoes, 15 cases, Potato Moth.

All the above were destroyed. * Refers to loose fruit, not packages.

TABU TED SUMMAR OF CAPE PRODUCE REJECTED BY THE TRANSVAAL ON AC OF THE ACCOMPANYING PESTS.

Article.	Disease.	Extent to which infected by Sample examined.										Re-consigned.		Destroyed.		Total Rejected.	
		1 %		1 % to 2 %		2 % to 5 %		5 % to 10 %		Above 10 %							
		Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.
May, 1909.																	
Apples	Codling Moth	...	...	5	80	...	...	1	1	...	...	5	80	1	1	6	81
	Aonidiella aurantii ...	...	...	...	...	...	...	4	403	...	...	4	403	...	...	4	403
Quinces... ...	Codling Moth	...	...	...	...	1	9	...	...	...	...	1	9	...	...	1	9
Oranges ...	Red Scale	...	...	...	...	...	...	3	17	...	...	3	17	...	...	3	17
	Citrus Rot	...	...	...	...	...	...	1	12	...	...	...	...	1	12	1	12
Lemons... ...	Red Scale	...	...	...	...	...	...	1	19	...	...	1	19	...	...	1	19
Potatoes ...	Phytophthora infestans	...	...	...	...	...	...	...	...	2	97	2	97	...	...	2	97
	Nectria Solani ...	1	1	2	48	1	36	...	...	...	...	4	85	...	...	4	85
	Eelworm	...	...	...	...	...	...	...	...	5	224	5	224	...	...	5	224
Totals for	May	1	1	7	128	2	45	10	452	7	321	25	934	2	13	27	947

CORRESPONDENCE.

Machinery for Potato Planting and Harvesting.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Would you or any of your readers inform me the best make of potato harvesting and planting machinery for South Africa. In the few places in South Africa where I have seen potato machinery it was allocated to the scrap heap, and I was informed, by the farmers that it was of no use. Now the potato crop in America is largely raised by machinery, and I believe, in Scotland machinery is being more used in recent years. I am unable to understand why potato machinery should be a success in America and not here. Of course, it is clear that in stiff, tenacious clays, these machines would not work satisfactorily. I would be glad if anyone who has been successful with these machines would give me particulars of some, also the nature of the soil, etc., worked by them.—Yours, etc.,

INQUIRER.

Constantia.

Citrus Fruits in Cold Districts.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I want to plant some fifty orange and naartje trees on my farm, but as I am entirely a novice in citrus growing I will be greatly obliged for a little information and some practical hints either from yourself or some farmer who also lives in a cold district, and will be kind enough to let me profit by his experience.

With the exception of Colesberg itself, and a couple of farms, this district is really too cold, or rather, the frosts are too severe to grow citrus trees successfully. On the farm I now own are some twelve orange and naartje trees about thirty years old, and though the fruit never attains that stage of perfection which it does in warmer parts of the Colony, yet the trees are so beautiful and the fruit quite good enough to make it worth while to plant some more.

To my kind informant I would ask to write as if writing to a man who knows nothing. What kinds would you recommend for a cold climate? Are there not early kinds that could be picked before say at the end of May, before the worst frosts have set in? Must I get grafted trees or seedlings? How far apart must I plant, and must I manure or not? How would it be to plant some other trees around the oranges to serve as a break wind and shelter, and what tree would best suit here, also one that would not be a host for red scale.—Yours, etc.,

FARMER.

Achtertang, June 28.

"Farmer's" proposition seems scarcely what could be described as encouraging. The acknowledged conditions are distinctly unfavourable for citrus fruits, and the only wise thing to do in such a case is first to carefully make the fullest local enquiries, with the view of finding out what efforts have been previously attempted in this direction. The direct questions as to varieties, etc., can best be answered by experienced nurserymen who have been handling citrus trees for some time. Among these probably Messrs. Flanagan Bros. of Komgha, would be able to give him the best advice. On the face of "Farmer's" letter one feels tempted to reiterate Punch's famous advice to those about to marry: Don't.—Editor, *Agricultural Journal.*

Worms in Ostriches—Treatment with Bluestone.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Allow me a few lines in your next paper. In the issue of February I noticed a letter from Mr. J. D. Beneke, of Robertson, in which he recommends bluestone as a remedy for worms in ostriches. Well, I have treated 15 chickens of 2 months old, exactly as Mr. B. prescribed, with the result that to-day I have all of them. I have dosed those birds three times and every time treated them according to the recommendations of Mr. B. And I wish to thank him for the splendid remedy which he has made known to ostrich farmers. Previously I could not rear them, there is no doubt that by following carefully the recommendations of Mr. B. one expels the worms totally from the ostriches.—Yours, etc.,

C. W. RADEMEYER.

Thorndale. P.O. Patentie, District Humansdorp, July 12.

Sheep and Wool.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Mr. Watermeyer's observations, in the July issue of your *Journal*, touch on a very important point in the sheep and wool industry of our country, namely:—The yield of pure, good wool per sheep. In the past, I fear very few people, when buying rams, ever considered what proportion of pure wool they were getting on a sheep carrying quite a heavy fleece. So long as such a sheep gave merely a good weight of fleece it was all right. But now, any sheep farmer who seriously considers the new aspect of things, which the "Alfred Beit Cup Competition" has exhibited, must feel convinced that the usual way of buying sheep, on their mere weight of fleece, is but a speculative method of improving the "*wool*" yield of a flock. As one of the rising generation, I have ventured these few remarks on the subject.

Possibly one may be thought a little too exacting and unsparing, should one expect sheep-lords and veterans to expound on the arts of a very remunerative ram trade.

In the "Midland News" of the 17th inst., appeared a letter by Mr. Roscoe Wood, in which he sets forth, very convincingly, how extreme fashions in sheep breeding, in America, have ever been detrimental to their sheep and wool industry, and I think the same may be applied to the industry in this, and in fact nearly every sheep raising country in the world.

Now the craze for wrinkles is running high, but it would be well for our sheep farmers to take heed of Mr. S. B. Holling's timely warning as to the deteriorating effects of excessive folds or wrinkles on the uniformity and quality of the fleece. See "Pastoralists Review" of September, 1908, page 592.—Yours, etc.,

C. C. VERMAAK.

Leeuwfontein, 26th July, 1909.

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NOTES ON THE WEATHER OF JUNE, 1909.

By CHARLES M. STEWART, B.Sc., Secretary to the Meteorological Commission.

A mean depth of rainfall only one-third of the normal, mean barometric pressure slightly less than the average, days unusually warm, and nights mild for the season of year; frosts less severe and of less general occurrence than usual; an almost entire absence of snow, sleet, hail and thunderstorms; clearer skies, infrequent fogs, a marked prevalence of Northerly winds stronger than usual, with a comparatively large number of hot winds, were the most noticeable features of the weather of June, 1909.

DIVISION.	Mean Rainfall (1909).	Mean No. of Days.	Average Rainfall (1891-1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	2·82	9	5·84	13	—3·02	— 52
South-West ...	2·31	7	3·48	8	—1·17	— 34
West Coast ...	1·01	5	1·44	6	—0·43	— 30
South Coast ...	0·40	5	2·18	6	—1·78	— 82
Southern Karoo ...	0·31	2	0·90	3	—0·59	— 66
West Central Karoo ...	0·13	1	0·54	2	—0·41	— 76
East Central Karoo ...	0·02	1	0·42	2	—0·40	— 95
Northern Karoo ...	0·01	1	0·62	2	—0·61	— 99
Northern Border ...	0·00	0	0·42	1	—0·42	—100
South-East ...	0·01	1	1·03	3	—1·02	— 99
North-East ...	0·00	0	0·88	3	—0·88	—100
Kaffraria ...	0·02	1	0·79	2	—0·77	— 97
Basutoland ...	0·00	0	0·98	2	—0·98	—100
Orange River Colony...	...	...	0·70	2	...	...
Durban (Natal) ...	2·56	1	0·94	...	+1·62	+172
Bechuanaland ...	0·00	0	0·39	1	—0·39	—100
Rhodesia ...	0·01	1	0·14	1	—0·13	— 93

Precipitation.—The mean rainfall, based on returns from 326 stations, was only 0·58 in. on 2 days, being 0·92 in. or 61 per cent. less than the average. This amount is 1·70 in. less than the mean for the preceding month (May) and 1·78 in. less than the amount recorded during the corresponding month of last year. The accompanying table shows that there was a general and very serious deficiency over all the divisions, the only exception being Durban (Natal), where a fall of 2·56 ins. on the 25th caused an excess of precipitation over the average of 172 per cent. In fact, a state of drought (partial or absolute) may be said to have prevailed throughout the month over practically all sections except the Cape Peninsula, South-West and West Coast, and even there the deficit averaged 52 per cent. over the first, and 30 per cent. over the last-mentioned areas Compared with the preceding month there was a general decrease over all divisions in the amounts registered, whilst a comparison with June, 1908, shows a much greater diminution of the sectional rainfall, with the exceptions of Durban (Natal) and Rhodesia. An analysis of the monthly totals shows that of the 326 stations reporting this month, 170 or 52 per cent. suffered from absolute drought; 44 or 13½ per cent. had 0·01—0·10 ins.; 13 had 0·11—0·20 ins.; 15 had 0·21—0·50 ins.; so that an additional 22 per cent. experienced partial drought during the month. Of the remainder, 21 had 0·51—1·00 in.; 24 had 1·01—2 ins.; 20 had 2·01—3 ins.; 8 had 3·01—4 ins.; an equal number had 4·01—5 ins., leaving three (3) with over five inches (5 ins.), viz., Muizenberg, 5·17 ins.; Maclear's Beacon (Table Mountain), 5·69 ins.; and Ceres, 6·94 ins. On similarily scrutinising the maximum amounts recorded in 24 hours, it is found that, of 318 stations supplying the necessary details—in addition to the 170 with "Nil"—52 had 0·01—0·10 ins.; 46 had 0·11—0·50 ins.; 35 had 0·51—1·00 ins.; 12 had 1·01—2 ins.; and three (3) had more than 2 ins., viz., Newlands (Montebello), 2·21 ins.; Kenilworth, 2·26 ins., both on the 27th, and

Durban (Natal) 2·56 ins. on the 25th. There was an unusual dearth of *Thunderstorms*, only 14 being noted on 8 days, chiefly the 23rd and 26th, only single instances being noted on the other six dates. There was an entire absence of any fall of *Hail* during the month. A mixture of *Snow* and *Sleet* was reported as occurring at Dunedin on the 7th. Notwithstanding the unusual dryness of the month, the country is mostly in fairly good condition over the greater part of the country, except along the South Coast, the situation being reported as becoming very serious at Great Brak River, where the farmers are stated to have been unable to plough for the regular crops.

Temperature, Cloud, and Wind.—The unusual mildness and unseasonable character of the month is fairly well brought out by the mean temperature of all the stations (55·7°), which is only 1·8° lower than the previous month and 3·2° warmer than June, 1908. Compared with the normals, the monthly temperature shows a mean excess of 1·7°, the mean day temperatures being 2·5° and the mean night temperatures 0·9° higher than usual. The mean value of the daily maximum temperatures (67·5°) is only 0·8° lower than during May, but 4·1° higher than in the previous June; and the mean of the minimum temperatures (44·0°) is only 2·8° lower than in May last, but 2·4° higher than the corresponding value for June, 1908. The mean daily range (23·5°) is 2·0° more than in May, and 1·7° more than during the corresponding month of last year. In comparison with the normals, the monthly temperature at the individual stations was mostly higher than usual by amounts ranging from 0·2° at East London to 4·3° at Stutterheim. Over the Cape Peninsula the monthly temperature was rather curious in its distribution, there being an excess of 2·4° in Cape Town, decreasing southwards to Wynberg, where there was a deficit of 0·2°, whilst Simonstown also showed a deficit of 0·1°. In the east the only station having a mean temperature lower than usual was Kokstad with a difference of *minus* 0·7°; at Hopefountain (Rhodesia) the mean monthly temperature was 4·9° cooler than usual. The day temperatures were also mostly above the average by amounts ranging between 0·1° at Port St. John's and 6·9° at Evelyn Valley. Wynberg, Simonstown, Hopetown and Hopefountain were the only exceptions, the deficits ranging from 0·2° at the first to 4·7° at the last of these places. Similarly the night temperatures were mostly higher than usual, except at a few stations in the Cape Peninsula, at Port Elizabeth, Hanover, Kokstad, and Hopefountain. The excesses were mostly small, being mostly only a few tenths at the coast stations but increasing to 2—4 degrees in the interior, being greatest (5·2°) at Hopetown. The deficits at the stations already mentioned were also small (0·3° to 1·5°) except at Kokstad (2·4°) and at Hopefountain, where it amounted to 5·1°. The mean warmest station was Port St. John's (62·8°), and the mean coldest, Hanover (45·0°), a difference of 17·8°. The highest mean maximum of 73·6° belongs to Umtata, and the lowest mean minimum of 25·4° to Hanover. Several warm spells occurred during the month, notably 2nd to 3rd, 9th to 12th, 22nd to 26th, although some of the highest readings of the thermometer were registered on 5 other dates. The coldest mornings occurred mostly about the middle of the month (15th to 17th) and on the 30th, the lowest readings at the separate stations being recorded on only 9 days altogether. The mean value of the highest maxima was 78·6° or only 3·3° lower than in May, and 2·8° higher than in the previous June, whilst the mean of the lowest thermometric readings (35·4°) was only 1·9° below the corresponding value for May but 1·7° above that for June, 1908. There was, therefore, a mean monthly range of 43·2°. The extreme readings for the month were 90·0° on the 12th at Port Nolloth and 18·0° on the 15th at Murraysburg, an extreme monthly range of 72·0°. *Frosts*, although much more numerous than during May, were still comparatively infrequent for the season of the year, only 151 instances being noted on the 30 days, most widely on 14th to 18th and 29th to 30th. Even these were mostly slight, the most severe, as far as actual damage is concerned, being that noted as occurring at Kruis River on the 30th (6·0° belowing freezing point) which was sufficiently intense to ruin the guava crop. At Retreat, in the Cape Peninsula, the minimum over grass fell below freezing-point on only three occasions, viz., 2nd, 11th, and 15th, causing a deposit of hoar-frost on the 11th; the mean value of these readings were 40·5°, ranging from 49·5° on the 28th to 29·9° on the 11th. At Kokstad the unusual mildness of the season was causing some of the trees to bud.

The mean amount of *Cloud* was only 37 per cent., being 10 per cent. less than in May, and 2 per cent. below the value for the corresponding month of last year. The mean was highest (64 per cent.) over the Cape Peninsula, decreasing Eastwards and Northwards, being 42 per cent. along the South Coast, 28 per cent. over the South-East, and 21 per cent. over Kaffraria. It ranged from 72 per cent. at Cape Point to only 9 per cent. at Tabankulu. *Fog* and *Mist* were of comparatively rare occurrence, being noted on only 75 occasions on 28 days, principally 13th, 17th to 19th and 24th. The two days on which this phenomenon was not observed were the 11th and 23rd.

The prevalent morning *Wind Directions* were Northerly (N.E. to N.W.) over the greater part of the country, although it was South-Easterly at Port Nolloth, Teyateyaneng and Hopetown, S. at Kuruman, S.W. at Umtata, and Westerly at most of the

South Coast stations. The mean *Force* was 1·91 on the Beaufort Scale, corresponding to a mean velocity of 12·6 miles per hour or 0·4 miles per hour more than in May, and 0·2 miles per hour more than in the previous June. The winds were strongest in the South and West, and lightest in the East and centre. The Royal Observatory records show an excess of N., N.W., W., W.S.W. and South-Easterly winds, but a marked decrease of those from points between S.S.E. and S.W. as well as of those from W.N.W. and N.N.W. The mean velocity was 7·4 miles per hour or 2·8 miles per hour less than usual. The wind was reported as attaining the strength of a *Gale* at 49 stations on 17 days, principally the 6th. *Hot Winds* were noted at 20 places on 14 days mostly during the first 9 days of the month. No *Duststorms* were reported. *Shocks of Earthquake* were experienced at Kokstad on the 2nd, 20th and 21st.

The mean barometric *Pressure* at the Royal Observatory (30·16 ins.) was 0·02 ins. lower than the normal for this month.

Stations.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory ...	66·5	48·4	57·4	79·0	11	38·8	15
Cape Town (S.A.C.) ...	66·0	50·7	58·4	81·0	2 & 11	42·0	1
Simon's Town ...	65·0	53·0	59·0	82·0	2	49·0	15
Retreat ...	66·1	46·1	56·1	83·9	2	36·1	11
Wynberg ...	65·1	46·9	56·0	80·5	2	41·0	16
Bishopscourt ...	64·8	45·7	55·2	80·0	2	43·0	16
Blaauwberg ...	64·2	48·9	56·5	79·0	6	44·0	15
Table Mountain (Disa Head)	57·5	45·0	51·2	70·0	2, 5 & 11	37·5	8
Robertson Plantation ...	69·0	38·9	54·0	82·0	6	30·0	15
Elsenberg (Agri. College) ...	65·0	47·6	56·3	79·2	2	42·1	1
Danger Point ...	63·0	52·5	57·8	82·0	6	46·0	1
Groot Drakenstein ...	67·3	43·8	55·5	80·0	2	35·5	15
Port Nolloth ...	67·1	46·6	56·8	90·0	12	41·0	10 & 15
O'okiep ...	69·2	44·5	56·8	78·1	2	35·3	30
Concordia (Knysna) ...	70·5	50·9	60·7	84·4	2	43·0	15
Cape Agulhas ...	64·6	51·8	58·2	83·0	6	45·0	8
Heidelberg ...	70·1	40·7	55·4	87·0	6	32·0	30
Port Elizabeth ...	69·6	50·6	60·1	85·0	3 & 12	43·0	1 & 30
George (Plantation) ...	69·4	48·5	59·0	82·2	12	40·0	19
Cape St. Francis ...	68 1	52·4	60·2	84·0	3 & 12	42·0	30
Van Staaden's ...	70·5	47·3	58·9	83·0	26	35·0	30
Storm's River ...	70·2	47·4	58·8	85·0	3 & 25	32·0	30
Dunbrody ...	75·3	41·5	58·4	84·6	12	28·8	30
Murraysburg ...	62·6	32·2	47·4	70·0	23	18·0	15
Hanover ...	64·6	25·4	45·0	68·0	28	19·0	16
Kimberley ...	68·4	39·1	53·8	74·2	24	30·6	17
Hope Town ...	64·3	38·2	51·2	72·6	22 & 23	27·0	16
East London ...	70·6	50·6	60·6	85·0	29	43·0	16 & 17
Sydney's Hope ...	68·1	49·5	58·8	76·8	3	39·0	15
Stutterheim ...	71·1	46·3	58·7	77·0	12	31·7	30
Cathcart ...	64·5	40·8	52·6	68·6	12	30·0	30
Bedford ...	70·3	45·2	57·7	80·0	26	28·0	15
Lovedale ...	72·1	41·3	56·7	80·0	12 & 25	31·0	30
Evelyn Valley ...	68·1	44·8	56·4	77·0	12	30·0	16
Chiselhurst ...	75·8	48·5	62·2	86·0	28	41·0	15
Aliwal North ...	66·8	31·8	49·3	69·5	10 & 23	25·0	16 & 17
Rietfontein (Aliwal N.) ...	59·8	33·4	46·6	66·1	26	27·6	16
Kokstad (The Willows) ...	66·5	33·0	49·8	72·0	9 & 10	28·0	17
Tabankulu ...	68·9	42·2	55·5	75·0	3 & 12	35·8	17
Port St. John's ...	73·0	52·5	62·8	87·0	29	47·0	19
Umtata ...	73·6	38·2	55·9	82·0	3	31·0	16
Main ...	69·8	44·7	57·2	75·6	12	33·5	30
Teyateyaneng ...	61·2	35·2	48·2	65·0	24 & 25	28·0	17
Kuruman ...	68·5	33·6	51·0	74·0	12	31·0	15
Hope Fountain ...	65·7	41·8	53·7	71·2	14	37·2	10
Means ...	67·5	44·0	55·7	78·6		35·4	...
Extremes ...	...	...	...	90·0	12	18·0	15

OBSERVERS' NOTES.

GROOT DRAKENSTEIN.—A warm dry month, with wind and cloud below the average. Mean temperature 1·5° above the average. Rainfall just about half the normal only. The rainfall for the past 12 months, *i.e.*, 1st July, 1908—30th June, 1909, amounted to 25·40 inches, differing from the normal (35·30 ins.) by nearly 10 inches.

KOKSTAD (The Willows).—A calm sunshiny month for the most part, with frost nearly every morning, but little rain (0·02). The monthly mean temperature was higher than for many years. The grass is wonderfully green, and some trees are already budding.

VRUCHTBAAR (Wellington).—Rainfall, though light, was fairly evenly distributed over the month, and the ground always in good condition for ploughing, etc.

ALGERIA (Clanwilliam).—Nights have been very cold during the month, with very sharp frosts.

KENDREW.—Weather throughout the month unusually warm and windy.

MUCH PUTFONTEIN (Aberdeen).—Veld grand.

THEEFONTEIN (Hanover).—Sharp frosts all through the month. Light northerly winds prevailed, with occasional cloudy days. Farmers busy ploughing—mainly wheat. Veld in good order and stock healthy. Springs and bore-holes going strong.

SUNNYMEADE (Albert).—This has been a very calm month with frosty nights.

KOKSTAD (Gaol).—Country looks brown; so far we have had a mild winter.

NOTTINGHAM (Mafeking).—The winter up to this point has been remarkably mild. Slight frost has been experienced, but no ice has been observed.

CARRICKMORE (Molteno).—High winds and frosty during the month.

GREAT BRAK RIVER (George).—Very dry, and farmers are unable to plough for regular crops. Situation becoming very serious.

KRUIS RIVER (Uitenhage).—Severe frost on the 30th (6° below freezing-point); guava crop ruined.

FORMOSA (Plettenberg Bay).—The driest month ever known in this district.

SUNNYSIDE (Uitenhage).—Dry month; no rain at all.

VARKEN'S KOP (Middelburg).—Strong northerly winds have prevailed during the month, followed on 30th by sharp frost.

DAGGA BOER (Bedford).—Had no rain for this month, but very heavy wind—North-East; some roofs taken off in Bedford, also in the country. With the exception of a cold snap for a week, it has been warm unseasonable weather.

GLENCAIRN (Cathcart).—Very high winds during the month.

HUXLEY (Stutterheim).—Veld very good up to now on account of the autumn rains. Stock doing well, but is beginning to fall off in condition. Rain will soon be needed.

VENTERSTAD.—Hard frosts during the month.

ARMADILLO CREEK (Vryburg).—Rainfall nil, no frosts, thermometer never reading below 32°, no wind to speak of.

CARNARVON FARM.—This is the first June I have had to record a totally dry month. We always have more or less sleet or "sago" showers. June is only a few points, but although on five different occasions N.W. gales brought up heavy banks of clouds, and apparently under the most favourable conditions, yet not a drop of moisture has fallen. Unless we have a good rain or snowstorm within the next fortnight all dry land crops will suffer most severely if not "wrecked." The mean wet for June, as shown at foot, is 0·625 ins. Wind, frosts and "no clouds" are not far off the averages. Stock of all kinds are in good condition, and should be able to stand the next three critical months. A few cases of gall-sickness amongst cattle are reported. Dams full and fountains strong.

Year.	Rain.	Wind.	Frosts.	No Clouds.
1901	0·66	16	23	4
1902	2·14	4	24	9
1903	0·36	16	21	7
1904	0·10	12	21	4
1905	0·56	14	16	0
1906	0·61	12	19	6
1907	0·11	13	19	6
1908	1·08	17	26	3
1909	0·00	14	19	4
Means	0·625	12	21	5

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Plumstead, Culmwood	3·93
Muizenberg (St. Res.)	5·17
Simon's Town, Wood	2·08
Cape Point...	1·01
Blaauwberg Strand	0·98
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Maitland Cemetery	1·40
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Woodhead Tunnel...	3·02
Lower Reservoir	2·26
Maclears Beacon	5·69
Waai Vlei	4·43
Woodhead Dam	3·75
Retreat	2·62

II. SOUTH-WEST:

Eerste River	1·46
Klapmuts	2·86
Stellenbosch, Gaol	2·46
Somerset West	2·76
Paarl	3·09
Wellington, Gaol	2·73
Groot Drakenstein, Weltevreden	3·18
Tulbagh	1·99
Kluitjes Kraal	2·55
Ceres	6·94
The Oaks	2·07
Caledon	1·46
Worcester, Gaol	1·84
Hex River	2·18
Karnmelks River	0·93
Lady Grey, Div. Robertson ...	0·58
Robertson, Gaol	1·18
Do. Govt. Plantation ...	1·02
De Hoop	0·85
Danger Point	1·47
Elgin Plantation	4·45
Elsenberg Agricultural College...	2·36
Roskeen	1·73
Vruchtbaar	3·88

III. WEST COAST:

Anenous	0·25
Klipfontein	0·45

III. WEST COAST (continued):

Station	INS.
Kraaifontein ...	0·39
O'okiep	0·35
Garies	0·52
Van Rhyn's Dorp ...	0·34
Clanwilliam, Gaol	0·60
Dassen Island ...	0·99
Kersefontein ...	1·15
The Towers ...	1·42
Malmesbury ...	1·79
Piquetberg	1·70
Wupperthal ...	0·88
Hopefield (Gaol) ...	0·84
Algeria (Clanwilliam)	1·92
Cedarberg (do.)	2·59

IV. SOUTH COAST:

Cape Agulhas	0·84
Bredasdorp...	0·93
Swellendam	1·18
Potteberg	0·42
Grootvaders Bosch	1·10
Heidelberg	0·13
Riversdale	0·30
Mossel Bay...	0·36
Great Brak River...	0·27
George	0·57
Do. (Plantation)	0·46
Woodifield (George)	0·96
Sour Flats	0·39
Concordia	0·75
Buffel's Nek	0·26
Plettenberg Bay	0·09
Harkerville	1·00
Blaauwkrantz	0·43
Lottering	0·59
Storms River	0·58
Witte Els Bosch	0·71
Humansdorp	0·06
Cape St. Francis	0·20
Witteklip	0·00
Van Staden's, Intake	0·05
Do. On Hill	0·08
Kruis River	0·18
Uitenhage (Park)...	0·13
Armadale (Blue Cliff)	0·00
Dunbrody	0·16
Port Elizabeth (Harbour) ...	0·15
Do. (Walmer Heights)	0·09
Shark's River (Nursery)... ...	0·16
Centlivres	0·16

V. SOUTHERN KAROO:

Ladismith	0·72
Calitzdorp	0·13
Oudtshoorn	0·40
Kleinpoort...	0.00

VI. WEST-CENTRAL KAROO:

Zwartberg Pass	0·80
Beaufort West, Gaol	0·00
Dunedin	0·15

VI. WEST-CENTRAL KAROO: *contd.*

	INS
Nel's Poort	0·00
Roos Plaak	0·07
Baaken's Rug	0·00
Willowmore	0·15
Rietfontein	0·00
Steytlerville	0·00

VII. EAST-CENTRAL KAROO.

Aberdeen, Gaol	0·03
Aberdeen Road	0·00
Klipplaat	0·00
Winterhoek	0·07
Kendrew, Holmes	0·00
Graaff-Reinet, Gaol	0·12
Roodebloem	0·00
Glen Harry	0·00
Wellwood	0·03
Jansenville	0·00
Roode Hoogte	0·03
Toegedacht	0·00
Klipfontein	0·00
Pearston	0·00
Middlewater	0·00
Somerset East, Goal	0·05
Muchputfontein	0·00

VIII. NORTHERN KAROO.

Fraserburg	0·23
Brakfontein	0·00
Victoria West	0·00
Britstown	0·00
Wildebeestkooij	0·00
Murraysburg	0·00
De Kruis, Murraysburg	0·00
Hanover	0·00
Theefontein	0·00
Philipstown	0.00
Petrusville	0·00
The Willows, Middelburg	0·00
Ezelpoort	0.00
Plaatberg	0·00
Grape Vale	0·00
Ezelfontein	0·00
Roodepoort	0·00
Groenkloof	0·00
Vlakfontein	0·00
Vogelsfontein	0·00
Plaatfontein	0·00
Colesberg	0·00
Varkens Kop	0·01
Culmstock	0·00
Droogefontein	0·00
Cradock (Gaol)	0·00
Witmoss	0·00
Maraisburg	0·00
Steynsburg (Gaol)	0·01
Hillmoor	0·00
Tarkastad	0·00
Waverley	0·00
Schuilhoek	0·00
Vosburg	0·00
Zwavelfontein	0·00

IX. NORTHERN BORDER:

Kenhardt	0·02
Upington	0·01
Van Wijk's Vlei	0·05
Prieska	0·00
New Year's Kraal	0·00
Dunmurry	0·00
Griquatown	0·00
Douglas	0·00
Hope Town	0·00
Newlands, Barkly West	0·00
Kimberley (Gaol)	0·00
Do. Stephens	0·00
Strydenburg	0·00
Mazelsfontein, Herbert	0·00
Rocklands, Barkly West	0·00

X. SOUTH EAST:

Melrose, Div. Bedford	0·00
Dagga Boer	0·00
Lynedoch	0·00
Bedford (Gaol)	0·04
Do. (Hall)	0·03
Sydney's Hope	0·00
Adelaide	0·00
Atherstone	0·00
Alexandria	00·9
Fort Fordyce	0·00
Graham's Town (Gaol)	0·00
Heatherton Towers	0·00
Fort Beaufort	0·00
Katberg	0·00
Seymour	0·00
Glencairn	0·00
Port Alfred	0·00
Hogsback	0·00
Peddie	0·00
Keiskamma Hoek	0·00
Cathcart (Gaol)	0·00
Do. (Forman)	0·01
Do.	0·00
Thaba N'doda	0·00
Evelyn Valley	0·04
Perie Forest	0·00
Isidenge	0·00
Kologha	0·01
King William's Town (Gaol)	0·00
Stutterheim, Bousfield	0·04
Fort Cunynghame	0·00
Kubusie	0·00
Quacu	0·01
Blaney	0·00
Berlin	0·00
Bolo	0·07
Fort Jackson	0·00
Prospect Farm, Komgha	0·00
Komgha (Gaol)	0·01
Chiselhurst	0·00
East London West	0·03
Cata	0·00
Wolf Ridge	0·00
Dontsah	0·00
Mount Coke	0·00
Albert Vale, near Bedford	0·01
Huxley Farm, Stutterheim	0·00
Izileni, King Wms. Town	0·00

XI. NORTH-EAST:

Venterstad	0·00
Mooifontein	0·00
Lyndene	0·00
Thibet Park	0·00
Sterkstroom (Station)	0·00

XI. NORTH-EAST (*contd.*)	INS.
Rooklands	0·00
Aliwal North (Gaol)	0.00
Carnarvon Farm	0·00
Whittlesea	0·00
Queenstown (Gaol)	0·00
Rietfontein, Aliwal North ...	0·00
Dordrecht	0·00
Herschel	0·00
Lauriston	0·00
Lady Frere	0·00
Keilands	0·06
Barkly East	0·00
Cliftonvale	0·05
Hughenden	0·00
Indwe (Collieries)	0·00
Bensonvale Inst., Herschel ...	0·00
Sunny Meade, Div. Albert ...	0·00
Hopewell, Imvani	0·00
Clifton, Sterkstroom	0·00

XII. KAFFRARIA.	
Cofimvaba	0·03
Tsomo	0·04
N'qamakwe	0·05
Main	0·02
Engcobo	0·03
Kentani	0·00
Maclear	0·00
Idutywa	0·00
Willowvale	0·00
Mount Fletcher	0·00
Somerville, Tsolo	0·00
Elliotdale	0·00
Umtata	0·03
Cwebe	0·00

XII. KAFFRARIA (*contd.*)	INS.
Tabankulu	0·00
Kokstad	0·02
Do., The Willows ...	0·02
Seteba	0·00
Insikeni	0·07
Port St. John's	0·11
Umzimkulu	0·00
Umzimkulu, Strachan ...	0·00
Tent Kop, Elands Height	0·03
Elton Grange, Mount Currie	0·00

XIII. BASUTOLAND :	
Mafeteng	0·00
Maseru	0·00
Teyateyaneng, Berea	0·00
Qacha's Nek ...	0·00

XIV. NATAL :	
Durban, Observatory	2·56

XV. BECHUANALAND :	
Taungs	0·00
Vryburg	0·00
Setlagoli	0·00
Kuruman	0·00
Nottinghame, Mafeking ...	0·00
Armadillo Creek	0·00

XVI. RHODESIA :	
Hopefountain	0·01

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The following Table of Current Market Rates (Wholesale) of Agricultural Produce on Saturday, the 24th July, 1909, ruling at the several centres named, is published for general information.

Centre.	A. Wheat per 100 lbs.	B. Wheat Flour per 100 lbs.	C. Boer Meal per 100 lbs.	D. Mealies per 100 lbs.	E. Mealie Meal per 100 lbs.	F. Barley per 100 lbs.	G. Oats per 100 lbs.	H. Oat-hay per 100 lbs.	J. Lucerne Hay. per 100 lbs.	K. Potatoes per 100 lbs.	L. Tobacco (Boer Roll) per lb.	M. Beef per lb.	N. Mutton per lb.	O. Fresh Butter per lb.	P. Eggs per doz.	Q. Cattle (Slaughter)	R. Sheep (Slaughter)
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		
Aliwal North..	0 12 6	1 1 6	0 13 9	0 5 6	0 7 6	0 7 6	0 7 6	0 6 0	0 5 0	0 7 6	0 1 0	0 0 6	0 0 4	0 1 6	0 1 6	£10	14/-
Beaufort West	0 15 0	0 18 6	0 15 0	0 7 6	0 12 6	0 10 0	0 6 6	0 6 6	0 5 6	0 10 0	0 0 9	0 0 3	0 0 3	0 1 3	0 1 6	£7 10s.	12/-
Burghersdorp	0 13 6	0 18 6	0 16 3	0 6 3	0 8 0	0 6 8	0 9 4	0 5 0	..	0 8 6	0 1 3	0 0 9	0 0 4	0 1 3	0 1 0	£10	14/6
Cape Town ..	..	..	..	..	..	0 7 0	0 5 4	0 4 0	0 5 9	0 15 0	..	..	..	0 1 3	0 1 3	..	..
Glenwilliam ..	0 12 9	..	0 13 9	0 7 0	..	..	0 6 6	0 6 0	..	0 6 0	0 0 9	0 0 6	0 0 7	0 1 6	0 1 0	..	..
Golesberg ..	..	..	..	..	..	..	..	0 6 0	..	12/6 to 17/6	..	0 0 3	0 0 4	1/- to 1/3	1/- to 1/3	..	..
Cradock ..	0 14 0	..	0 15 0	0 7 0	..	0 8 6	0 8 0	0 5 6	0 4 0	0 10 0	0 0 9	0 0 4	0 0 3	0 1 3	0 1 3	..	..
Dordrecht ..	0 11 6	0 19 0	0 16 6	0 6 0	0 8 0	0 5 0	0 9 0	0 5 6	0 6 0	0 9 0	0 1 0	0 0 3	0 0 3	0 1 1	0 0 9	£10	12/6
East London ..	0 11 0	0 18 0	0 15 9	0 5 6	0 14 6	0 5 6	0 6 6	0 3 3	0 6 6	0 12 0	0 1 0	0 0 3	0 0 5	0 1 7	0 1 5	£10	19/-
Graaff-Reinet	0 14 6	..	0 14 3	0 6 6	..	0 9 0	..	0 4 0	0 3 6	0 10 6	..	0 0 3	0 0 4	0 1 6	0 1 3	£8	14/6
Grahamstown	0 8 9	..	0 12 6	0 6 6	..	0 5 0	0 5 9	0 4 10	..	0 11 3	0 0 5	0 0 5	0 0 5	0 1 9½	0 1 5	..	..
Kimberley ..	0 12 3	0 16 9	0 15 6	0 5 0	0 6 8	0 7 9	0 6 8	0 5 2	0 4 10	0 12 6	0 0 5½	0 0 8	0 0 5	0 1 0	0 1 2	£7 15s.	11/-
King William's Town ..	0 10 0	0 17 6	0 15 0	0 5 9	0 6 6	0 5 6	0 4 6	0 3 3	0 3 0	0 10 0	0 0 6	0 0 5	0 0 5	0 1 4	0 1 0	£9 10s.	14/6
Malmesbury ..	0 11 0	0 15 0	0 12 6	0 10 0	..	0 6 0	0 5 0	0 3 9	..	0 9 0	0 0 9	0 0 6	0 0 5	0 1 4	0 1 0	£10	16/-
Mossel Bay ..	0 9 6	0 18 6	0 16 6	0 7 3	..	0 5 6	..	0 3 6	..	0 10 0	0 0 4	0 0 5	..	..	0 1 0	..	..
Port Alfred ..	0 12 0	1 0 0	0 18 0	0 7 0	0 10 0	0 9 0	0 11 0	0 3 0	..	0 8 0	0 0 6	0 0 6	0 0 6	0 1 9	0 1 0	£12	20/-
Port Elizabeth	0 9 6	..	..	0 6 6	..	0 5 9	0 6 0	0 5 0	..	0 11 6	..	0 0 6	0 0 6	0 1 6	0 1 9	..	..
Queenstown ..	0 14 6	0 17 0	0 14 0	0 4 9	0 8 0	0 9 0	0 9 0	0 5 6	0 4 0	0 9 0	0 0 5	0 0 4	0 0 5	0 1 6	0 1 0	..	..
Tarkastad ..	0 11 9	1 1 0	0 14 9	0 6 6	0 12 0	0 6 0	0 5 6	0 4 0	0 3 6	0 7 6	0 1 0	0 0 3	0 0 3	0 1 3	0 1 0	£7	15/-
Vryburg ..	0 15 0	1 0 0	0 12 6	0 4 6	0 6 6	0 11 0	0 10 0	0 3 0	0 5 6	0 13 6	0 0 4	0 0 8	5d. to 7d.	0 1 6	0 1 3	£7 to £8	10/- to 12/-
Worcester ..	0 11 6	0 15 6	0 12 6	0 7 3	0 8 3	0 7 0	0 5 6	0 4 0	0 4 6	0 9 0	0 0 6	2d. to 8d.	0 0 4½	0 1 6	0 1 0	£8	12/- to 16/-

NOTE.—A blank space denotes "no transactions."

PRODUCE MARKETS.

CAPE TOWN.

The Produce Department of the firm of R. Müller, Cape Town, reports for the month of July, 1909, as follows :—

Ostrich Feathers.—The London Sales opened on the 26th July. There was an abundant supply of the usual average assortment. My cables state that Best Long Whites, Long Feminas, White and Coloured Boos and Drabs are 7½ per cent. to 10 per cent. lower, while Blacks and Medium class Whites are firmer.

	£	s.	d.	£	s.	d.
Super Primes ...	15	0	0	35	0	0
First, ordinary to Super	12	0	0	17	0	0
Seconds	7	0	0	9	0	0
Thirds... ...	3	0	0	5	0	0
Femina Super ...	10	0	0	15	0	0
Do., Seconds to Firsts ...	4	10	0	10	10	0
Byocks (Fancy) ...	5	0	0	9	0	0
Long Blacks	3	10	0	7	0	0
Medium Blacks ...	1	10	0	3	10	0
Short to Medium ...	0	10	0	1	5	0

	£	s.	d.	£	s.	d.
Floss	0	5	0	1	15	0
Long Drabs	2	0	0	4	0	0
Medium Drabs ...	0	15	0	1	10	0
Short to Medium ...	0	5	0	0	15	0
Floss	0	5	0	1	15	0
White Tails	1	5	0	2	10	0
Coloured Tails ...	0	5	0	2	0	0
Chicks...	0	1	0	0	2	0
Spadonas	0	10	0	5	0	0
Inferior Black and Drabs, short to long	0	0	6	1	10	0

Wool.—The London Wool Sales were held last month, and although a good enquiry prevailed, prices showed a decline. Short and medium Grease of ordinary quality declined from ¼d. to ½d. Ordinary Scoureds from ½d. to 1d., while Super qualities remained unchanged. Offerings on the Cape Town Market during the past month consisted mostly of Calvinia, Piquetberg and Malmesbury lots. I quote :—Calvinia, Long Light, from 5½d. to 6½d.; Medium, from 4¾d. to 5¼d.; Malmesbury and Piquetberg fair to good, 4½d. to 5½d; Heavy and burry, from 3½d. to 4½d.

	s.	d.	s.	d.
Super long Grass Veld ...	0	7½	0	8½
Do. Karoo	0	5½	0	7½
Medium	0	4	0	5¼
Short and inferior	0	3½	0	4

	s.	d.	d.
Wool for Washing	0	4½	5½
Snow-white Super to Extra	-	-	7
Do. Ordinary ...			4
Fleece Washed			9

Mohair.—The enquiry which set in during the end of June and the early part of last month has fallen away again, and there is now a moderate demand for Medium quality Hair. Super Fine First and Kids are wanted, and find a ready sale. Reports from Bradford state that on the whole the trade is in a healthy state.

	s.	d.	s.	d.
Firsts, Summer	0	11	0	17½
Kids	1	10	2	0
Seconds ...	0	5	0	6½
Winter ..	0	8	0	9
Do. Kids..	1	0	1	2

Hides and Skins.—There is a brisk enquiry for all sorts, and prices are firm. Coat Skins show, if anything, a rising tendency. All classes of Hides are wanted, and consignments will arrive to a good market.

	s.	d.	d.
Long woolled Skins ...	0	5½	6¼
Short...	0	4¼	4¾
Shorn	0	3¼	3½
Bastards	0	3½	4
Cape Skins, each	2	3	9
Do., cut, each ...	0	0	3

	s.	d.	s.	d.
Goat, heavy to light ...	0	11½	1	1½
Sundried	0	0	0	6
Angoras	0	5½	0	6
Sundried Hides	0	5½	0	7½
Salted	0	5	0	6½
Wet...	0	3½	0	4½

PORT ELIZABETH.

Messrs. John Daverin & Co. report as follows:—

Ostrich Feathers.—The London Sales opened on Tuesday last, and our cable reported: "Prices on the average unchanged." This news is more satisfactory than was generally anticipated. Our Market has again been fully supplied with the usual average assortment. On Monday and Tuesday it was very unsettled, but on Wednesday it became steadier, and all good qualities brought satisfactory prices. Common sorts, however, continue neglected, and sold badly. The total quantity sold on the Market amounted to £11,747 7s. 8d., and weighed 5,618 lbs. Next week's shipment will be the last for the London October Sales.

	£	s.	d.		£	s.	d.
Primes: Extra Super		Special Prices.					
Good to Super ...	20	0	0	to	40	0	0
Whites: Firsts ...	10	0	0	„	20	0	0
Seconds ...	4	0	0	„	9	0	0
Thirds ...	1	0	0	„	4	10	0
Feminas: Super ...	10	1	0	„	18	0	0
Firsts ...	6	10	0	„	10	10	0
Seconds ...	2	10	0	„	5	10	0
Thirds ...	0	10	0	„	2	10	0
Greys ...	1	10	0	„	7	0	0
Fancy	2	10	0	„	8	0	0
Tails: White	0	5	0	„	2	10	0
Light	0	5	0	„	2	0	0
Coloured & Dark	0	0	6	„	0	15	0

	£	s.	d.		£	s.	d.
Blacks: Long	1	15	0	to	7	0	0
Medium	1	0	0	„	4	0	0
Short	0	4	0	„	1	0	0
Wirey	0	0	3	„	0	0	6
Floss	0	5	0	„	1	7	6
Drabs: Long...	0	15	0	„	3	10	0
Medium	0	10	0	„	1	10	0
Short...	0	1	6	„	0	7	6
Wirey	0	0	3	„	0	0	6
Floss...	0	5	0	„	1	10	0
Spadonas: Light	0	5	0	„	5	0	0
Dark	0	2	6	„	2	0	0
Chicks... ...	0	0	0	„	0	5	0

The following may be quoted as the approximate current values of unsorted parcels, per line:—

	Whites.	Feminas.
Superior pluckings	£8 0 0 to £10 0 0	£5 10 0 to £7 10
Good Average lots	6 10 0 to 7 10 0	4 10 0 to 5 0
Poor Average lots	4 0 0 to 5 0 0	2 0 0 to 2 10
Common lots, stalky, narrow and discoloured	2 0 0 to 3 10 0	0 15 0 to 1 15 0

	Tails. d. s.	Blacks. s. d. s. d.	Drabs. s. d. s. d.	Spadonas. s. d. s. d.
Good	15 0 to 17	20 0 to 40 0	12 6 to 15 0	30 0 to 40 0
Average	7 6 to 12	12 6 to 17 6	7 6 to 10 0	10 0 to 22 6
Poor	2 6 to 5	7 6 to 10 0	5 0 to 7 6	2 6 to 7 6

It will be understood that for Special Lots, these quotations may be exceeded.

Wool.—This Market continues steady, but it being between seasons, very little business has been done in the open market during the week. On yesterday's public market only a small quantity was offered, prices showing no change.

Snowwhite, Extra Superior ...	17½d to 18d
Do. Superior	16d „ 16½d
Do. Good to Superior...	15d „ 15½d
Do. Inferior Faulty ...	13d „ 14d
Grease, Super Long, well-conditioned, Grassveldt grown (special clips)	8d „ 9½d
Do. do. do.	7d „ 8d
Do. do. Karoo grown (special clips)	6½d „ 7½d
Do. do. do. ...	5½d 6½d
Do. do. Mixed Veldt...	6d „ 6½d
Do. Light, faultless, medium Grassveldt grown ...	6d „ 7d
Do. do. Karoo grown	6d „ 6½d
Do. do. short, do.	5½d „ 6d
Grease, Coarse and Coloured ...	1d to 3½d
Scoured do. do. ...	2d „ 9d
Basuto Grease, short	6d „ 6½d
O.R.C. Grassveldt Grease, long & well-conditioned (special clips)	6d „ 7½d
Do. do. do. ...	5½d „ 6½d
Do. do. medium grown, light, with little fault	5½d „ 6½d
Do. do. short, faulty & wasty	4½d „
Do. do. Karoo grown, long & well-conditioned ...	5½d „ 5½d
Do. do. medium grown, light with little fault ...	4½d „ 5d
Do. do. short, faulty and wasty...	3½d „

Mohair.—This market remains very quiet, and the only sale of any importance during the week was made by ourselves, of about 100 bales average Firsts and mixed lots. The tone of the market continues firm, and prospects cheerful. On the Public Market on Tuesday a limited quantity was offered to a quiet demand, prices showing some decline on the previous week's sale.

Super Kids	**23d to 24d**	**Mixed O.R.C. Hair (average)**	**8½d to 10d**
Ordinary Kids and Stained ..	**18d „ 22d**	**Do. very mixed ...**	**7d „ 8d**
Superior Firsts, special clips ..	**12¼d„ 12½d**	**Seconds and Grey ... ...**	**5d „ 7½d**
Ordinary Firsts...	**11¾d„ 12d**	**Thirds .. ..**	**4½d„ 4¾d**
Short Firsts and Stained ..	**10d „ 10½d**	**Winter Kids, special clips ...**	**14d „ 14½d**
Superfine Long Blue O.R.C Hair	**10d „ 10½d**	**Do. good ordinary ...**	**13d „ 14d**
		Winter Hair	**9d „ 9d**
		Basuto Hair	**8½d „ 9d**

Skins.—Sheepskins in bundles, 5½d.; Pelts, 3¾d.; Capes, 22d.; damaged, 7d. each; Goatskins, 12¼d.; damaged, 6d. per lb., and Heavy Goatskins, 8½d.; Angoras, 6¾d.; Shorn, 5d.; damaged, 3d. per lb.; Johannesburg Sheep, 5d.; Goats, 9d.; Angoras, 6d.; Springbok, 8½d. each.

Hides.—Sundried, 8d.; damaged, 7d.; Salted, 7d.; damaged, 6d.; Thirds, 3d.

Horns.—3½d. each all round.

EAST LONDON.

Messrs. Malcomess & Co. report for the month of July:—

Wool.—The most important event of the last month has been the fourth series of Colonial Wool Sales held in London. In our last we expressed the fear that values might decline in those Sales, which fear was strengthened by a decline of 2½—5 per cent. established in the Antwerp Sales held on 3rd inst. We were, therefore, not surprised when receiving news of the opening of the London Sales on 6th inst., that Snow Whites and Super Long Combing Grease were unchanged. Average Long Combing and all sorts of Short Grease declined par to 5 per cent.

As the Sales progressed there seemed to be a fair demand for Snow Whites and Long Grease, which sold without change, but Short Wools (particularly average Kaffrarian Farmers 6 months seem to be neglected) at the end were ¼d. to ½d. per lb. cheaper.

On 20th inst. the Sales closed flat without further change in prices, 14,000 bales Australasian (including 10,000 bales Crossbreds) and 2,000 bales Cape Wools being held over for the next Sales, commencing 21st September next. At these Sales we believe under 100,000 bales will be offered. This being a rather small quantity, it may temporarily prevent any further decline in wool, but we think we must see a lower range of values when the new Clip arrives freely to the consuming centres, which should be early in December.

We hear from Australia that shearing is already beginning in many districts, consequently we shall see an earlier season than last in that quarter. Owing to scarcity of wool no Public Sales have been held in our market during the past month. The demand has been restricted partly, on account of the disappointing result of the London Sales, and partly because the Wools now offering are very heavy, short and faulty Wools. Transactions during the month are about 1,000 bales, leaving stocks in town at about 1,800 bales.

We quote as follows:—

	6 months Summer Grease.		6 months Summer Grease.
Aliwal	**4¼d to 4¾d**	**Cathcart (according to quality and condition) ... ...**	**5¼d 6¼d**
Burghersdorp, Heavy Red ...	**4d „ 4½d**	**Stutterheim ... ...**	**6d 7d**
„ Bluish, Superior Stormberg	**4¾d „ 5¼d**	**O.R.C.:**	
Dordrecht (according to quality and condition)	**4½d „ 4¾d**	**Northern (according to quality and condition) ...**	**5d 5¾d**
Barkly East	**5¼d „ 5½d**	**Wepener**	**4½d 5d**
Elliot	**5½d „ 5¾d**	**Rouxville**	**4½d**
Molteno, Heavy Red	**4¼d „ 4¾d**	**Zastron**	**4½d**
„ Superior Blue Stormberg	**4¾d „ 5¼d**	**Philippolis**	**5d**
Tarkastad, Heavy Red... ...	**4¾d**	**Native:**	
„ Light Blue ...	**5¼d „ 5¾d**	**Transkei**	**6¼d „ 7d**
Queenstown (according to quality and condition)	**5¼d „ 5¾d**	**Basuto**	**5½d „ 6¼d**

Mohair.—Cables from London report the Market as very quiet in consequence of weaker advices from this side. It would appear that speculators rushed up prices unduly at the commencement of the season, which has had the effect of checking consumption. In consequence scarcely anything is doing. Early in the month we could effect sales of Super Kids at 22d. and Super Firsts at 12½d., but we do not think they can be repeated to-day. The season for Long Blue Mohair is approaching, and we think demand will be chiefly on Long Blue Hair of Superior quality and free from Kemp. We quote:—Superior Long Blue Mohair, fully 12 months' growth, of fine quality and free from Kemp, 11d. to 11¾d.; Good Average Long Blue Mohair, slightly Kempy, 10d. to 10½d.; Basuto Native Mohair, for sorted lots, 9d.; Basuto Native Mohair, average parcels, 7½d. to 8½d.; Seconds, 5½d. to 6½d.; Dockings and Grey, 4d. to 5d.; Winter-hair, 9d.

Sundry Produce.—The following prices have been realised:—Sheepskins, 5⅜d.; Pelts and Coarse and Coloured, 4d.; Goatskins, 12¼d.; Angora Skins, 7¼d.; damages, 5d. each; Hides, Sun-dried, 8⅜d.; Dry-salted, 7⅜d.; Horns, 3½d. to 4d.

APPLICATIONS FOR AGRICULTURAL EMPLOYMENT.

Strong, healthy lad, aged 17, Colonial born, speaks English and Kafir, with little Dutch, wants situation on good mixed farm. Will work hard for board and small salary for a man who will teach him. Had fair education, can teach little boys part time. Used to country life.—Reply, J. E. TITTERTON, Cofimvaba.

MILK RECORD.

ELSENBURG COLLEGE HERD.

Subjoined is the Milk Record to the 31st July, 1909 :—

Breed and Cow.	Days in Milk.	Yield in Lbs.		
		During July.	Total to date.	Daily Average.
FRIESLANDS.				
Rose	345	559	9,973	28·9
Daisy	212	793	7,414	35·0
Cleopatra	89	1,449	4,670	52·5
Victoria	80	1,332	3,685	46·1
Vera	38	1,022	1,231	32·4
Violet	19	784	784	41·3
Bell	7	323	323	46·1
JERSEYS.				
Gilliflower	332	185	6,497	19·6
Gertie	82	886	2,319	28·3
Grace	38	703	869	22·9
Gwendolen	38	808	1,003	26·4
Gladys	31	861	861	27·8
AYRSHIRE.				
Cherry	87	638	2,281	26·2
Queen Dot	27	941	941	34·9
Lobelia	16	596	596	37·3
SHORTHORN.				
Maggie	17	491	491	28·9
CROSS.				
Bessie	38	1,651	1,968	51·8

BREEDERS' DIRECTORY & FARMING NOTICES.

Advertisements under this heading are inserted at the rate of 30 words for 2s. 6d., (minimum charge) per insertion, and 6d. per line of approximately six words above that number. Payment must accompany Order. Cheques and P.O.O. to be made payable to the CENTRAL NEWS AGENCY 125-127, Long Street, Cape Town, to whom all communications should be addressed.

OSTRICHES.

SPECIALS ONLY.—Choice pairs, £50 to £100 per pair.—F. W. BAKER, Laughing Waters, Willowmore.

OSTRICHES. — Young and old.—For further particulars, apply to Mr. R. S. DE VILLIERS, The Imperial Cold Storage and Supply Co., Ltd., Porterville Road.

PIGS.

BERKSHIRE BOARS.—Pure bred. Ages two to fifteen months. Bred by Charles Leonard, Esq. on his well known "Gloria" Estate —For further particulars, apply to Mr. R S. DE VILLIERS, The Imperial Cold Storage and Supply Co., Ltd , Porterville Road.

PURE BRED BERKSHIRE PIGS.—Prize Winning Stock. Boars and Sows, £3 each. Also Buff Orpington and White Leghorn Poultry. —Apply MANAGER, Maitland River Farm, Green Bushes Hotel, Port Elizabeth.

CATTLE.

FRIESLAND BULLS, bred from the best IMPORTED stock, from few weeks to fifteen months old.—For further particulars, apply to Mr. R. S. DE VILLIERS, The Imperial Cold Storage and Supply Co. Ltd., Porterville Road.

ENGLISH BREEDERS.— WILLIAM COOPER AND NEPHEWS, "Cooper Dip" Works, Berkhamsted, England' Shorthorn, Hereford and Polled Cattle ; Shropshire Sheep ; Berkshire and Large Black Pigs. 54 First Prizes at British Shows last year. Every facility given to Colonial Buyers. Send to W. C. & N., P.O. Box 305, East London, Cape Colony, for "Pedigree Stock and its Export," gratis and post free.

GENERAL.

PASPALUM GRASS PLANTS.—Strong roots per Rail or smaller plants per Post to any address. See larger advertisement, page ix. this Journal.—A. C. BULLER, Dwarsriviers Hoek, Stellenbosch.

HEAVY YIELDING GRASSES.—The Celebrated *Paspalum Dilatatum*, unrivalled for butter or fattening stock. Price per lb., 6d. ; freight 30/- extra to South African ports. The Wonderful Drought-resisting Rhodes Grass, 7/- per lb., p. free. Yield, about 12 tons per acre. Very nutritious and palatable to all classes of Stock. Gives good results under adverse conditions of soil and climate. Most strongly recommended to South African Stock Owners. Also *Grand. Couch d' Paspalum* and the winter grasses, *Phalaris Commutata* and *Coerrulescens*, 3/- per packet each, from B. HARRISON, Burringbar, N.S.W., Australia. Cash must be posted with the Order.

LUCERNE AND ALL FARMER'S SEEDS.

Samples and Prices on application.

D. MULLER & CO., Seedsmen,

Hamburg, Germany.

THE POULTRY YARD.

BRONZE TURKEYS, Pure Bred.—Settings of Eggs, 12/- a dozen. Also young Cocks for Sale. F. W. STRANGMAN, "Erinvale," Somerset West.

WHITE LEGHORNS.—From two of the Best American Strains. Eggs, 3/6 per dozen. Cockerels, 5/- each, packed and delivered F.O.R. Correspondence invited. – C. R. PLUMBLY, "The Gums," Porterville Road, C.C.

BUFF ORPINGTONS, SILVER WYANDOTTES, BLACK MINORCAS, Winners of over 90 prizes. Bred for Utility and Show points. PULLETS from 10/-, also COCKERELS from 7/6. Will improve the table and laying qualities of common fowls. Mrs. R. F. DOTT, Kenilworth, Kimberley.

WRIGHT BROS., Highlands, Cape, Breeders of Black and Buff Orpingtons, White and Partridge Wyandottes, Black Langshans and Champion Laying WHITE LEGHORNS. Birds for Sale from 10/6 up. Terms Cash. Birds not approved may be returned. Please Note 400 Birds to select your wants from. Please mention this paper.

R. V. HAZELL, Tregenna, Park Road, Rondebosch, Breeder of White Wyandottes, Columbian Wyandottes and Black Orpingtons. My Wyandottes have won at all the leading Shows in South Africa, besides being excellent layers. I have procured a 1st Class Pen of Black Orpingtons from Graham Hope, who tops nests for layers and who has won handsomely all over the Transvaal. Correspondence and inspection invited.

WHITE LEGHORNS.—Best American Utility Strains. Settings of Eggs for sale, from pure-bred utility White Leghorns, F.O.R., 10/6 per setting of 15. Cockerels, 10/- to 20/-. Terms, cash with order. Mrs. W. L. STEEL. Stellenbosch.

BUFF ORPINGTONS. — THE FARMER'S FOWL. The fowl that LAYS WHEN EGGS ARE TOP PRICE. A 1 TABLE BIRDS. My Buffs have unlimited orchard and grass run, and are noted for hardiness and good laying qualities. Young stock always for sale at very reasonable prices. Ask for inclusive quotations ; carriage paid to any station in South Africa and AT MY RISK to rail destination. My list of prizes won at shows all over South Africa will convince you that this unrivalled *Colonial* strain of 10 years' standing CAN HOLD ITS OWN AGAINST IMPORTED STOCK. Buy hardy Colonial-bred birds and save your pocket. Address: A. C. BULLER, Dwarsriviershoek, Stellenbosch.

ANGORA AND MERINO RAMS.

The following members of the Bedford C.C Ram Breeders' Association will hold Public Sales of all Rams they breed for Sale (now sold privately on farm), on the Second Thursday in September October, January, March, at 11 o'clock, at Bedford :—

PRINGLE BROTHERS, Glen Thorn, P.O. Linton, Adelaide.
C. W. WEBBER, Havelock Holme, P.O. Bedford.
T. W. KING, Kingsvale, P.O. Bedford.
A. A. HOCKLY, Cullendale, P.O. Bedford.
W. D. HOCKLY, C__________, P.O. Bedford.
E. J. PRINGLE, Penderny, P.O. Bedford.
KEITH ROSS, Carvers, P.O. Bedford.
PAINTER & LEONARD, Prospect, P.O. Bedford.
&c., &c., &c.

All particulars and Catalogues to be obtained from the above.

Clients not being able to attend may place their orders with any of the Breeders, who (on satisfactory reference being given), will buy for them at the Sale.

THOMAS WM. KING, President.
T. C. HALL, Secretary.

Wanted by Young Colonial, 16 months experience, good Testimonials, Situation or Farm as Assistant.—Apply G. E. BOWER, "Summer Pride," East London.

THE

Agricultural Journal

OF THE CAPE OF GOOD HOPE.

No. 3. SEPTEMBER, 1909. VOL. XXXV.

Published Monthly in English and Dutch by the Department of Agriculture and distributed gratis to bona fide farmers in the Cape Colony on application through the Resident Magistrate of the District.

SUBSCRIPTION 5s. PER ANNUM. Post Free in South Africa.
Remittances to be made Payable to the Publishers CAPE TIMES, LTD., Church St., Cape Town.

Postal Address:
The Editor "Agricultural Journal," Department of Agriculture, Cape Town.
Telegraphic Address: "Bulletin," Cape Town.

CONTENTS.

NOTES.

Exportation of Angora Goats to German S.W. Africa.

The Government of German South-West Africa having enacted and promulgated legislation prohibiting the exportation of Angora Goats from its territory, save and except to such other South African States or Colonies as have enacted similar prohibitive legislation, the exportation of Angoras from the Colony to German S.W. Africa is now permitted.

Careless Correspondents Again.

Attention has frequently been drawn to the carelessness of correspondents addressing the Editor in search of information. The last case is typical. A letter was received early in August, asking urgently where a thermometer could be obtained for one of Henson's 60-egg incubators. No address was on the letter, but the signature looked like some form of Beamish. Messrs. Woodhead, Plant and Co., of Cape Town, are the agents for this machine, and can supply such articles, and this information was promptly posted to the only Beamish on the Free List. The letter was returned with the statement that such information had not been asked for. The net result is that this correspondent did not get the information he wanted, a great deal of trouble has been caused to two other people, and the whole might have been avoided by a clear signature and a postal address. As it is found next to impossible to deal with such letters no further attempt will be made in that direction.

Oudtshoorners Going to Fraserburg.

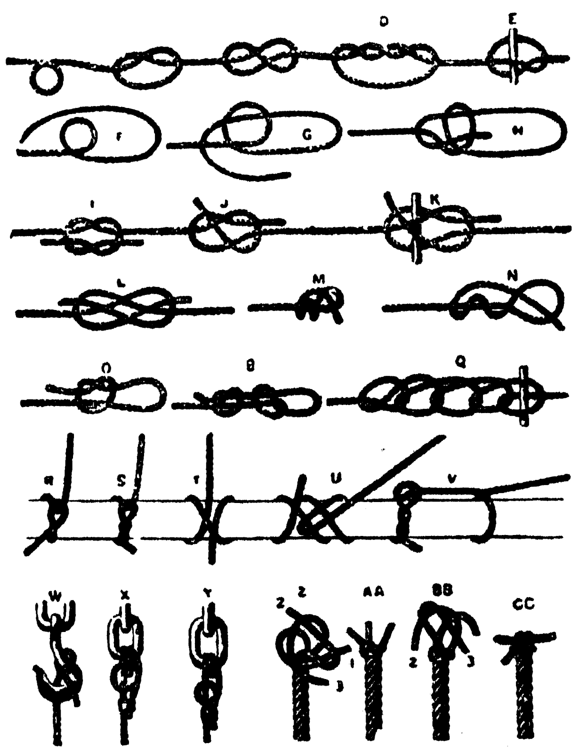
Mr. W. A. B. Rowan, C.C., Fraserburg, writes:—It is becoming a very pleasing feature to notice that the farmers of Oudtshoorn and Prince Albert are looking to this district as a field for future operations. Since my last report, Mr. F. S. Oosthuizen, of Zwartskraal, Prince Albert, has bought the farm Manhaars Kraal, adjoining the farm Stofkraal, belonging to Mr. Louw, and a syndicate of Oudtshoorn farmers. Mr. Oosthuizen is captivated with the soil along the Zak River, and intends to put a lot of capital into his venture. I am informed that several other people have secured options on farms higher up the river, and many inquiries are being made. The Zak River is still running, and has been so since January last. The river usually comes down about four times a year—February, March, October, and November—but, of course, this year the supply of water has been fairly even. With a progressive class of farmers on the Zak River there is no reason why the farms on its banks should not be the granary of the Colony, but a proper basis of irrigation must be adopted. The yields of good wheat are assured at 30 to 80 for

one in most years, and that with simple, inexpensive works, and with very light labour. Given the proper class of farmer, and a developing railway line, the Zak should become a veritable little Cape Nile. It is indeed a good sign to see men of the Oosthuizen, Louw, and Grek type coming into the District.

Knots, Hitches and Bends.

How many know how to tie a knot that will stay tied? Not many landsmen, according to our observation, though all acknowledge the value of such knowledge, particularly those engaged in agricultural pursuits in a sparsely populated country like South Africa. The pictures of knots shown herewith are taken from a little pamphlet called "Manilla Rope."

In this book we are told that these knots are known by the following names:—A, bight of rope; B, simple or overhand knot; C, figure-8 knot; D, double knot; E, boat knot; F, bowline, first step; G, bowline,



second step; H, bowline, completed; I, square or reef knot; J, sheet bend, or weaver's knot; K, sheet bend with a toggle; L, Carrick bend; M, stevedore knot completed; N, stevedore knot commenced; O, slip knot; P, Flemish loop; Q, chain knot with toggle; R, half-hitch; S, timber-hitch; T, clove-hitch; U, rolling-hitch; V, timber-hitch and half-hitch; W, Blackwall hitch; X, fisherman's bend; Y, round turn and half-hitch; Z, wall knot commenced; AA, wall knot completed; BB, wall knot crown commenced; CC, wall knot crown completed.

The principle of a knot is that no two parts, which would move in the same direction if the rope were to slip, should lie alongside of and touching each other.

The bowline is one of the most useful knots; it will not slip, and, after being strained, is easily untied. It should be tied with facility by every one who handles rope. Commence by making a bight in the rope, then put the end through the bight and under the standing part, as shown in G; then pass the end again through the bight and haul tight.

The square or reef knot must not be mistaken for the "granny" knot that slips under a strain.

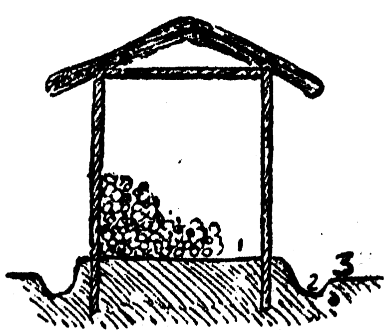
Knots H, K and M are easily untied after being under strain. The knot M is useful when the rope passes through an eye and is held by the knot, as it will not slip and is easily untied after being strained.

The timber-hitch S looks as though it would give way, but it will not; the greater the strain the tighter it will hold.

The wall knot looks complicated, but is easily made by proceeding as follows:—Form a bight with strand 1, and pass the strand 2 around the end of it, and the strand 3 around the end of 2, and then through the bight of 1, as shown in the engraving Z; haul the ends taut, when the appearance is as shown in the engraving AA. The end of the strand 1 is now laid over the centre of the knot, strand 2 laid over 1, and 3 over 2, when the end of 3 is passed through the bight of 1, as shown in the engraving BB; haul all the strands taut, as shown in the engraving CC.

Storing Onions on the Farm.

A travelling correspondent of "The Leader," writing from Barcelona, Spain, under date April 23, says:—"Valencia does an enormous trade in long keeping onions, stored in a very simple and inexpensive shed, which takes up but little room, and may be so contrived as to be shifted to the growing areas from year to year. The accompanying outline plan shows a long, narrow shed. It may be any length, but if very long should have hurdles or gates at the side, which may be opened outwards, of course, and the stock examined or withdrawn from any point. The square of this shed is about 4 ft., it is seldom higher, and never more than 4 ft. wide. Two rows of light posts or stakes are placed in the ground, and a heavy and wide spreading roof of straw, reed, or other litter is laid on, and kept firm with a coating of mud. Light battens are tacked as openly as possible on the sides, the floor raised with earth, taken to form a good drainage, and more or less straw used, to ensure a dry bed, and to exclude direct light from the bulbs lying against the sides of the shed. It is usual to put the shed in a very open position and broadside on to the prevailing wind.



1, Raised Earth Floor. 2, Drain Hollow. 3, Ground Level.

Foul Brood.—Prohibition of Used Bee Accessories.

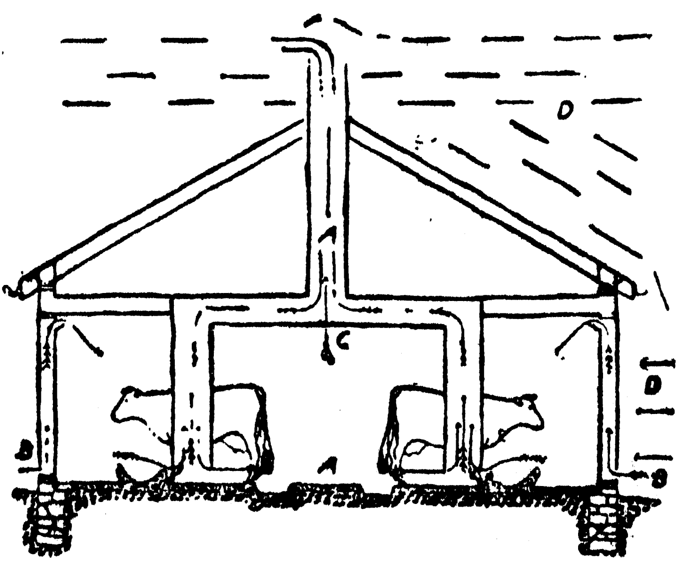
Owing to the existence of Foul Brood among Bees in other countries the importation is prohibited of all used beehives, hive accessories or appliances or anything which has been used to contain or manipulate bees or beeswax. The penalty is fixed, on conviction, at a fine not exceeding £100 or in default of payment six months imprisonment. This was gazetted on August 9, in Proclamation No. 352 of 1909.

South African National Union.

A list of all groceries and foodstuffs manufactured in South Africa is being compiled, and the Industries Sub-Committee will be glad if all makers of South African goods will send the names, and if possible, samples of the same to Mrs. Guy Brunton, "Amenti," Fife Avenue, Johannesburg.

The Ventilation of Cowhouses and Stables.

From his new work upon ventilation of farm buildings by King, of Wisconsin, the accompanying illustration is reproduced, concerning which it is stated:—"This is a section of a stable or cowhouse, showing the action of the wind at DD, forcing air into the building by direct pressure at BB, and out of it by suction at the top of the ventilating shaft AA. At C is a ceiling register in the ventilatng shaft, to be opened only when the stable is too warm or when the draught is too feeble." Referring further to the subject, the author says:—"It should be understood that the position of the outside openings for the entrance of air to the fresh air ducts, placed at some distance below that, admitting the air, is fundamentally important for the reason that only in this way can the escape of the warmest air through such openings on the leeward side be prevented. Without some such provision as this the case would be like lowering the windows at the top on opposite sides of a room, which always results in fresh air entering on the windward side, and the warmer air escaping on the other. With the arrangement adopted, as shown in the



illustrations, only a strong wind pressure can result in forming the warm air to descend and escape through intakes on the leeward side. The ventilation of buildings, which is so often attempted by raising a window at the bottom and inserting under it a screen carrying a pair of short tubes, like upturned pipe elbows, while better than no attempt, can seldom give adequate ventilation, for the reason that provision only is made for air to enter, and this can take place no faster than opportunity for escape exists. The opening of the door into a hallway or of the transom above it, as an example, usually has only the effect of making the box to be

ventilated larger, and the result usually is, with such makeshifts, that on windy days during cold weather, such window openings are closed to save heat, and during still weather there is little motive power to force an air movement if they are opened, and hence much of the time very inadequate ventilation must obtain."

Gowie's "Seeds and Plants, 1909 and 1910."

We have received a copy of this very useful work from Messrs. W. and C. Gowie, of Grahamstown, and can confidently recommend it to gardeners, orchardists and farmers. It is exceptionally well illustrated, and is supplied free of charge on application.

Successful Citrus Exports.

Mr. L. J. Roberts, of Baddaford, Fort Beaufort, has met with considerable success in the export of citrus fruits during the past season, and as the methods adopted may be of value to others, and he has very kindly supplied details to the Department, it has been considered advisable to publish them. The method of packing adopted was that in vogue in California, that is, in cases containing two compartments, each approximately of one cubic foot. The fruits were carefully *clipped* from the trees, care being taken not to scratch the skin. The pickers' nails even were kept short, and every precaution taken to prevent injury to the fruit. After picking, the fruits were taken inside and allowed three to four days in which to become cured—that is to allow the skin to become slightly wilted. They were then carefully sized in a mechanical grader into nine different sizes. The two smallest of these grades were rejected and the remaining sizes packed in separate boxes, each fruit being wrapped in good quality paper, neatly printed. The packing was done in accordance with diagrams used in California, each sized fruit being packed to a special diagram. When fully packed, the fruits stood above the cases from 1½ to 2 inches. The lid was then placed in position and forced home by mechanical means, nailed down and then bound with iron hoops.

The maximum and minimum numbers of oranges shipped in a single case were 250 and 96. Notwithstanding all the care and closest possible adherence to Californian methods the agents on the other side reported that a few oranges arrived decayed, but state that these shipments were among the nicest and soundest they have handled. Next season Mr. Roberts intends to exercise even more care in the picking, and for that purpose will use padded boxes. His opinion as to the cause of the bad arrival of Cape citrus fruits in England is that shippers and pickers are not fully alive to the importance of careful picking—"Clipping," he says, should be the correct word to use, for "picking" is ruination to oranges —and correct methods of packing. The slightest injury to the rind will probably result in decay during the voyage, and tight, *methodical* packing is also essential. The cases used, Mr. Roberts finds, are slightly over the size of those used in California. The standard case there is one of two compartments each measuring 11½ x 11½ x 12 inches, and he intends adopting that size next season. He also thinks that this Colony and South Africa generally should adopt a standard case. The information Mr. Roberts acted upon was supplied by Mr. Lounsbury, the Government Entomologist, who took a great interest in the work, and Mr. Roberts

found further help in a past Elsenburg student, Mr. Burdett, who was of great assistance to him in carrying out all the details with scrupulous care.

The test of most things, even in agriculture, is, after all, the monetary return, and here Mr. Roberts has reason to be quite satisfied with his experiments. The prices realised were quite good. The returns on Washington navel oranges, for instance, were 18/- per case of 150 fruits, and the expenses amounted to 6/- per case, a clear return of roughly 8/- per hundred fruits.

Seven Lambs within Two Years.

In forwarding the photograph of the above, an Imported German Rambouillet Ewe, Mr. W. C. Luckhoff, of Elberfeld, in the district of Albert, says:—This ewe has borne seven lambs within two years, and I believe it to be a record. She has now twin lambs doing well; eleven months ago she had triplets, but two of these died. The year before that she also produced twins, the triplets and twins being dropped within the year. The last two lambs weighed together turn the scale at 19¼ lbs. Her udder measures 14½ in. from the belly to the middle between the teats, and 20 in. round above the teats.

A Prolific Rambouillet.

The above photograph represents a Rambouillet Ewe belonging to Mr. M. J. La Grange, the well-known wool-grower, of Middelplaats, Riversdale, and his daughter Marina. They were both born on the same day, January 14, 1895. The ewe, which is now fourteen years of age, is of Mr. La Grange's original Rambouillet stock, has borne 19 lambs, sixteen of which were twins. She is shown with five months' wool.

Field Trials at Middelburg Agricultural Show in 1910.

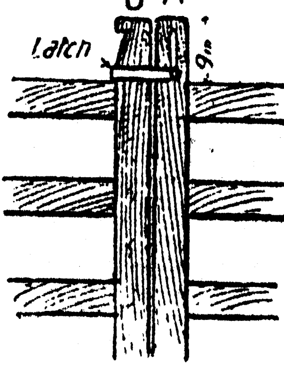
The Hon. Secretary of the Middelburg Agricultural Society (Mr. J. S. Minnaar) writes:—"At a recently held meeting of the committee of the Middelburg Agricultural Society, the desirability of offering a substantial prize for *Levelling Instruments*, suitable for farm use, was suggested by Mr. Montagu Gadd, of Springfield, Tafelberg Station, who has guaranteed to collect the amount of the prize, or, failing that, make it good himself. The Society is availing itself of this liberal offer and now wishes it to be widely circulated that a £25 prize will be offered for competition at the 1910 Show. The Society has entrusted Mr. Gadd and myself with the arrangement of all the details in connection with the trial and full particulars as to the conditions of entry, etc., will be obtainable from me at an early date.

"Now that irrigation schemes are being carried out by so many farmers in the dry districts of South Africa, a great want has sprung up for a cheap levelling instrument, easily understood and handled by the average farmer, having no special training in the use of such instruments, and with which the correct slope of furrows and lucerne lands can be laid out. It has been brought to the notice of the Society that many farmers, unadvised, have purchased builder's levels, at prices ranging from £5 to £10. These are at best only very poor substitutes for engineers' levels and, besides that, they have the very marked disadvantage that they are not in any way understood by farmers. Apart from this, unskilled hands experience a great difficulty in manipulating them, their adjustments are not permanent and consequently get out of order easily, and the farmer generally is altogether unable to detect this, with the result that very often works carried out at great expense are found to be useless. It is thus, with a view to checking the purchase of altogether unsuitable and too expensive instruments, and procuring something which is simple, easily handled and understood, and bringing together a collection of instruments, which lay claim to suiting the requirements of the farmer, and giving those interested an opportunity of comparing them side by side and obtaining expert opinion, that my Society has taken up the matter and trusts to make the trials a success by offering the inducement of a substantial prize."

We trust this effort will meet with success, and shall be glad to publish the results of the trials, together with photographs of the competing instruments. So long as the prizes are not on an extravagant basis, these Field Trials should be earnestly supported by all interested in agriculture.

Field Gate Fastener.

This is a rough sketch of gate-fastening, which no horse can open, and yet is so easily opened that a child can open it. Gate-opening horses who can open almost all gates have been tested, but the enclosed fastening has baffled them all. If they lift it from the front it jams in the slot cut out of post, as shown in B. If lifted from side, no matter which, the latch jams itself. A horseman can open it without dismounting, although it takes two hands to open the gate. Lastly, it is so simple that any one can make it. A and B are the two front pieces of gates. From top batten of gate to top of front piece should be about 8 in. or more. In A cut out slit about 4 in. long and ¼ in. wide. In B cut out piece as shown in sketch. About ½ in. deep is sufficient. Then out of hoop iron (about 1 in. wide is the best) make a latch which will fit well over A and B. Fasten latch with a bolt on front piece A, putting the bolt through slit. Take care that bolt will not jam in slit. It will be seen, then, that the latch cannot be lifted over B until the back of latch is raised to the top of slit with one hand; while the other hand can then lift the latch over B with ease, and allow the gates to be opened.



A Rural Reader for South Africa.

The long promised "Rural Reader" has now been issued by the Education Department and though it will not, in al probability, meet the full desires of many who are moving earnestly in the direction of agricultural education, it may be accepted as the first step in the new movement. The book has been produced in reality as one more to be added to the long list of "Readers" available for use in elementary schools. It may thus serve its purpose by interesting some of the younger people in the great vital industry of the country instead of having their heads filled with wild notions of gold and diamonds and easily acquired wealth. But there is a risk that the cost at which it is published may prove prohibitive. The charge of 2s. 6d. for a small school reading book is too high. There are few schools where such a price can be afforded. So that we now find ourselves in the possession of a possible white elephant. The work itself is very creditably done and Mr. A. B. Lamont, B.Sc., of the Education Department, is to be congratulated upon the restraint he shows all through. The difficulties of compressing a large mass of information into a simple, and at the same time intelligible, form are only appreciated by those who make the attempt. In this case the feature of the book is the care with which this work has been accomplished. It is, of course, all purely elementary, but it is none the less sound and valuable. Strange as it may seem to make such a statement, but the great need in South Africa is sound elementary knowledge in all matters agricultural. Many of our people are too prone to run after strange gods. They need, as a rule, grounding in the elements, and a book like the "Rural Reader," from its very simplicity shall assist in driving home the essential truths which such a course conveys. Progress is an excellent thing, but progress on uninformed lines is an exceedingly dangerous experiment. The Rural Reader is well got up and well printed and illustrated. The publishers are MacMillan and Co.

Calf Feeding and Calf Feeders.

In recent issues of this *Journal* attention has been directed to methods of avoiding and preventing serious troubles in young calves, the most

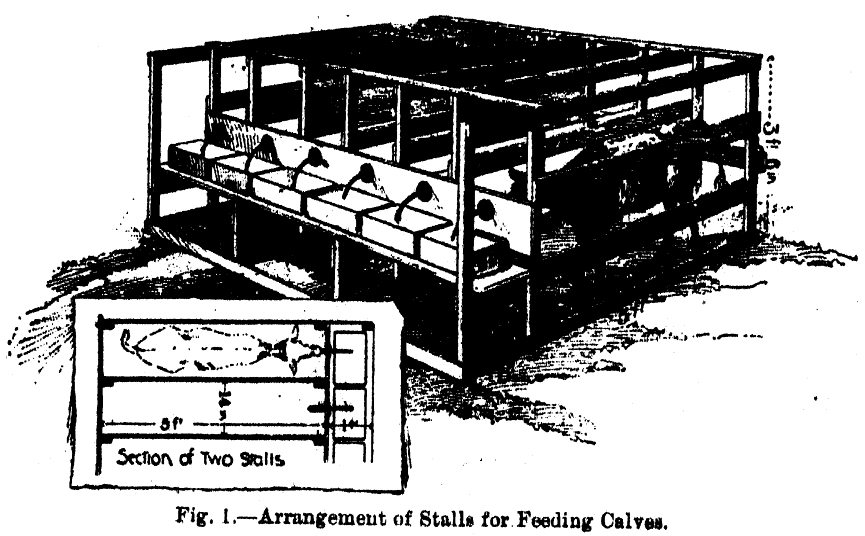


Fig. 1.—Arrangement of Stalls for Feeding Calves.

common of these being "white scour" or diarrhœa. Methods of management play so large a part in the successful rearing of calves that we feel constrained to return to the subject again. In the illustrations herewith (taken from the N.S. Wales *Agricultural Gazette*) the practice proved most acceptable there is demonstrated. Wooden casks for collecting the milk for calves and wooden troughs, we are told, cannot be too strongly condemned. In all cases metal should be used, as they can then be thoroughly cleansed daily by scalding. To prevent calves drinking too rapidly a number of stalls should be erected (see fig. 1), and each calf allowed to drink undisturbed from a separate bucket. This system, when the rubber teats are used (see fig. 2 and July issue of this *Journal*), gets as near Nature's methods as is practicable, and aids in the assimilation of the food. Of course, great care must be taken to keep rubber teats and tubes perfectly clean, and in any case where there may be doubt that they will be so kept miniature bails with a metal bucket for each calf are preferable. These metal receptacles need not necessarily be expensive. The lower half of a paraffine tin makes an excellent calf-feeding bucket. An allowance of the mother's milk materially assists the calf's development and strengthens its constitution. On no account should whey be considered a sufficient food for calves. The addition of formalin to the milk is also recommended as a further preventive. One ounce of formalin should be mixed with a pint and a half of water, and half a teaspoonful of the mixture added to the milk of each calf. A dose of castor oil (2 oz.) should be given to any calf showing signs of digestive derangement or scouring, followed by the administration of formalin as above; but good results from treatment must not be looked for, and all efforts should be concentrated on prevention.

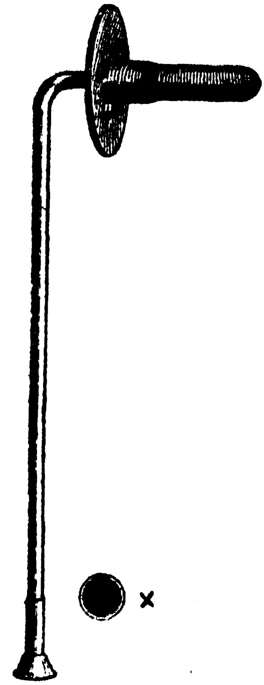


Fig. 2.—Patent Rubber Teat.
X Is the wire gauze on the end of feeder.

Evaporated Fruit.

A correspondent writes:—Twenty-nine thousand one hundred and forty pounds worth of dried fruit, exclusive of dates, were imported into South Africa during 1908. This sum could have been saved to the country, as there is an abundance of fruit. Only a small percentage of the importation comes from Great Britain and the Colonies, the bulk of the remainder of £24,869 comes from the United States, and considering that the fruit from that country comes from as far as California and has to be sent 3,000 miles by rail to New York and from there by steamer, it is astounding to find farmers in this country neglecting such a valuable industry. That good stuff can be produced with care and proper management has been fully demonstrated at the various agricultural shows during this year, the dried fruit exhibited being in no way inferior to the imported article, and these shows ought to influence the farmers to do likewise.

Many farmers complain that they do not know what to do with their surplus crops, as the prices obtained at the chief markets of South Africa are often unsatisfactory, owing to the large quantity of fresh fruit coming forward, and apparently there is not sufficient demand. Other farmers complain that it does not pay them to send fruit to the nearest market, as it gets bruised over the bad roads, and they therefore prefer to let it rot on the ground. Yet by drying it in a proper manner they could turn it all into money and have a good return for their trouble and outlay It is, of course, quite useless to think of success if the fruit is dried in the sun and simply bagged. Stuff of this kind finds no favour, because fruit dried in this oldfashioned manner has no tempting look about it apart from the maggots, which soon make their appearance, as, during the sundrying process, countless flies are attracted and deposit their eggs on the fruit. The bags, always more or less dirty, allow the dust to come in freely and the fibre sticks to the fruit, which is very objectionable. In the first instance the fruit has to be sorted, as no bad ones should be used, then fruit like apples, pears, quinces, etc., must be peeled by proper fruit peelers and if apple rings are to be made a combination parer is used, which peel, core, and slice the fruit, all at the same time. Apples darken almost immediately after being peeled, and this can be avoided by dropping the fruit into water in which a little salt has been dissolved. The packing must be done in a neat manner, paper lined boxes of uniform sizes all containing equal weight must be used and the contents and nett weight must be stencilled thereon.

The drying must, of course, be done in evaporators, which require no particular skill and which can be attended to by farmers' wives and daughters, who only need from time to time, to change the trays and refill them. Small evaporators with a drying surface of 8 and 10 square feet can be used on any ordinary cooking stoves whilst cooking is going on. Such small evaporators are in use in nearly every farmhouse on the continent of Europe, whereas owners of large orchards invest in evaporators, which have a drying surface of 20 to 60 square feet, with 12 to 20 interchangeable trays and mounted on specially constructed stoves, which may be used inside or out in the open. A large evaporator dries about 105 lbs. of apples in 12 hours and uses, during that time, about 30 lbs. of coal or an equivalent of wood, so that the cost of production is very small. The peels of oranges, citrons and Pampelmoes after having been boiled in sugar and dried in an evaporator, are best known as "candied peel." Ordinary pumpkin treated in a similar manner is turned into a very palatable "konfyt." Watermelon konfyt is dried to perfection in such evaporators, as well as candied fruit of any description. Vegetable farmers, who get only a small return for their produce in the height of the season, can do better by drying their surplus. Dried vegetables, like French beans, peas, cauliflower, etc., will find a ready sale when nothing else but fresh cabbage is obtainable and will be found to be an excellent addition to the otherwise monotony of the table, as they are nearly equal to the fresh article These are soaked in water a couple of hours before boiling and then treated as the fresh vegetables, Herbs of any kind may also be dried as also onions, tomatoes, potatoes, all of which are articles of enormous demand in other countries and farmers will do well to pay attention to this.

A Thousand Guinea Tasmanian for South Africa.

Mr. Fred. W. Southey, of Hillmoor, Steynsburg, who has been visiting Austrelia purchasing high-class sheep, writes from Launceston, Tasmania, enclosing the photograph reproduced above. Mr. Southey informs us that he has purchased this splendid ram for 1,000 guineas. Magician V. is by Magician III. by Magician by Hercules by Royal Hero, and was bred by Mr. John Taylor, of Winton, Tasmania. Mr. Southey has also purchased the Eskvale stud ram, Silverites by Sylvan, by Sylvester. Sylvan was sold last year to a South American buyer for a thousand guineas, and took the Grand Champion Prize at Sydney Show in 1907. Mr. Southey has also, he states, procured 23 of the best stud ewes he could

get in Tasmania: two from Mr. John Taylor (one a hundred guinea ewe), and two of the best Eskvale 4-tooth ewes on the estate. One of the latter took the championship this year at the Sydney Show, and they were purchased at 85 and 70 guineas each. Both are by the grand champion ram Sylvan. Another is a champion ewe by Alliance, bred by Mr. John Taylor, and sold for 390 guineas at the Sydney sales. Two are Bellevue ewes, the best 4-tooths on the estate, and another is a grand old ewe by Jubilee. The rest are of the best Fairfield and St. Johnstone ewe lambs, and three ewes and one lamb by Magician V. With this lot in hand Mr. Southey should be making things move in the South African sheep world.

BECHUANALAND FROM THE IRRIGATION STANDPOINT.

A RECONNAISSANCE SURVEY.

By F. E. KANTHACK, A.M.I.C.E., Director of Irrigation

During 1906 an application for the services of an Irrigation Engineer was received from the Vryburg District, and while complying with the application, advantage was taken of the presence of an Officer of the Irrigation Department in this part of the country to carry out an extensive Irrigation Reconnaissance Survey in Bechuanaland as it was generally understood that irrigation possibilities existed there.

During July, 1905, Mr. Gordon, late Director of Irrigation, visited the North Eastern portion of the Mafeking Division and was much struck with the facilities which the general slope and configuration of the country, together with its comparatively abundant rainfall offered for the storage of water by means of inexpensive earthen dams along the course of the tributary streams, of which facilities so far but little advantage appeared to have been taken. Mr. Gordon's impressions were merely superficial based upon a hasty inspection of a small portion of the country, and when the opportunity in 1906 offered he selected Mr. E. Burrows, Assistant Engineer, for the purpose of making a flying reconnaissance with the object of gaining a general knowledge of the configuration of the country, the flow of the rivers, the location, extent and quality of the irrigable lands; the present use and value of irrigation and the possibilities of its further extension, and more especially to ascertain the best localities and sites for more detailed surveys.

Mr. Burrows started his investigations at Vryburg on the 14th October, 1906, and toured steadily until the middle of January, 1907, most of his travelling being done in an ox-wagon.

Mr. Burrows submitted an able report during February, 1907, but his investigations were strictly confined to irrigation possibilities and the collection of hydrographic data, and were, moreover, productive of generally negative results.

(2) Towards the end of 1907 I spent about seven weeks in Bechuanaland, during which time I made a very extensive tour through the country. Accompanied by three Baralong natives, an ox-wagon and a couple of riding horses, I covered over five hundred miles of country, riding or walking most of the way, and was able to get into intimate touch with this fascinating country and its conditions. I covered a great deal of ground already traversed by Mr. Burrows, and had an opportunity of confirming the results of his investigations, but I took in a considerable amount of new ground and widened the scope of my investigations very much so as to include geological, physical, agricultural and economic aspects generally.

(3) In this report I have therefore attempted to draw a picture of certain parts of Bechuanaland which will, I trust, be of assistance to farmers who contemplate trying their luck in those districts; and of interest and also, I hope, assistance to those farmers who are already settled there. It is also necessary, I think, to convey a somewhat clearer idea of agricultural conditions in British Bechuanaland.

(4) The routes travelled over by Mr. Burrows and by myself are shown on the map accompanying this report. It was somewhat unfortunate that both of us were compelled to tour in this area in the season least fitted for trekking. The most suitable time of the year to travel is during the winter months when the wild melon or "Tsamma," which grows profusely in the dry sandy regions, makes the traveller independent of water for his transport animals. The summer is the rainy season, but paradoxical though it may appear, this is just the season when most water difficulties are likely to be encountered, especially towards the Kalahari Desert. In a tour of investigation such as this, travelling by day becomes a necessity, and trekking as I did very seldom less than twenty miles a day, in the heat, and water only at long intervals, the oxen and horses fared rather badly, especially towards the end of the tour where the veld was poor and the road hard and rocky. On two occasions the animals were without water for over forty-eight hours. The water difficulty placed great limitations on my movements, and precluded me from seeing the Molopo River below Daly's Pan, or of much of the country North-West of Morokwen. I was fortunate, however, in obtaining much valuable information of these tracts from Mr. Daly, of Logaging, who has an intimate knowledge of the block of country between Morokwen and the Molopo. My acknowledgements are also due to the Cape Mounted Police at Morokwen and Motiton, both on account of their generous hospitality and of the valuable information which they gave me. Settlers in Bechuanaland are few and far between, but all with whom I came into contact spared no pains in helping me with my work and in their efforts to make me as comfortable as possible. All these good people are very much cut off from the outer world, and appear genuinely pleased to welcome an official bent on acquiring a knowledge of local conditions on the spot.

(5) The tract of country described in this report is bounded on the north by the Molopo River, on the east by the escarpment of the Kaap Plateau to Vryburg, and thence northward by the railway to the North, on the west and south-west by the Kuruman Hills and the range of kopjes which run in continuation of them in a wide circle through Heuning Vlei and roughly form the limit of the Kalahari Desert on the west. To the south the boundary of Griqualand West may be taken as the limit.

(6) The area consists generally of a flat or slightly undulating country of monotonous aspect. The landscape is occasionally relieved by low hills and ridges and abrupt kopjes of no great altitude.

Around Vryburg and to the north, the surface is very flat, and rises gradually towards the Mafeking border near which is situated the main watershed of this portion of Bechuanaland. The altitude is greatest on the Transvaal border, where it reaches 4,600 feet. In the Lichtenberg district in the Transvaal rise the Hartz River, running south into the Vaal, the Molopo running west to the Kalahari and the Little Marico, which is one of the sources of the Limpopo running north. From this point the watershed between the Limpopo and Molopo runs north-west, crossing the railway to Buluwayo between Mafeking and Lobatsi and thence into the Kalahari of the Bechuanaland Protectorate. The watershed between the Molopo and the Dry Hartz crosses the railway near Maribogo, and runs thence in a south-westerly direction through the saltpans of Groote and Klein Chwaing and thence south to the Griqualand West border. The tract under consideration thus falls into two main drainage areas. The north-western or Molopo area and the south-eastern or Hartz River area.

(7) The Molopo area is a gentle rolling country with a gradual fall towards the north-west. Hills and kopjes are rare, and are formed invariably by hard rocks, such as quartz-porphyry, quartzite, or magnetic rocks. Vast stretches are entirely flat, intersected at long intervals by the

wide and shallow laagtes or valleys of the ancient drainage lines which appear upon the map as tributaries of the Molopo.

The Dry Harts area is very flat up the edge of the Kaap Plateau. Below this escarpment it appears generally as a very wide and fertile looking valley. The average altitude of the whole tract of country comprised in both areas is about 4,000 feet.

The Agricultural Point of View.

(8) Considered from an agricultural point of view which, as will be shown later on, is dependent upon geological conditions, I think the whole of Bechuanaland can be divided roughly into the following areas:—

Firstly, the *Great Kaap Plateau*, which consists almost entirely of the Campbell Rand series of dolomite limestone, cherts and shales.

Secondly,—The granitic area lying between the Molopo and Mashowing Rivers, and comprising the whole of the Mafeking fiscal division and large portions of the Vryburg division. The surface of this region is mainly a deep superficial deposit and the exposures of granite are few, yet the whole region is underlain by granite. It has, from an agricultural standpoint, distinct characteristics of its own. These features overlap the narrow belts of dolomitic and other formations on the western margin, as the soil covering is of great depth and granitic in origin.

Thirdly, both the Kaap Plateau and the granitic areas merge into the Kalahari Desert to the west of the disjointed range of hills running from Kuruman through Tsenin to Heuning Vlei.

Fourthly, and finally, there is the narrow belt of country between the escarpment of the Kaap Plateau and the Transvaal boundary. The present report deals with the first and second areas, and these will be described separately under different aspects. Travelling as I did from Ganesa to Kuruman, the very great change in the surface conditions and the flora and agricultural conditions to the north and to the south of the Mashowing River is very striking.

(9) The geological survey of Bechuanaland must still be considered to be in the preliminary stage. No systematic work was done prior to 1905, when the Geological Commission commenced survey operations in these parts, and these were continued until well into 1907 by Mr. A. W. Rogers, Director of Survey, and Mr. Alex. L. du Toit, Geologist. Prior to this survey work very little had been done, and two papers read before scientific societies by Messrs. G. W. Stow and G. G. Holmes are the only important scientific contributions on the subject which have been published. A great deal of valuable work has been done, but for many years to come our geological information regarding this tract must remain to a large extent of a sketchy character owing to the rarity of outcrops of rock; the surface being to a great extent covered by sandy surface deposits and calcareous tufas.

The complete results of the survey as far as they have been carried on have been published in the reports of the Geological Commission for the years 1905, 1906 and 1907, which contain much detailed information regarding the Geology of the Mafeking division and of the greater portions of the Vryburg and Kuruman divisions. Three geological maps, Nos. 49, 50, and 52, have been published of the above mentioned districts and also some additional sketch maps in the reports, and these together show all that is at present known about this country.

In the present case I am concerned with the geology of the country only in so far as it affects agricultural conditions and water supply, and in the map accompanying this report I have attempted to show the general geological structure of the country, apart from surface deposits and of geological details confined to small areas.

It will be seen that the north-eastern and major portion of the country under consideration consists mainly of granite and gneiss, which is the oldest rock in the country, and from above which vast thicknesses of newer rocks have been denuded. This granitic area forms a dome dipping away uniformly all around the circumference of the outcrop. The dome was once covered successively by certain igneous and metamorphic rocks forming the Ventersdorp system on the eastern portion. Over-lying this again on the east and the granite on the west, came the quartzites, flagstones and conglomerates of the black reef series; the dolomites, cherts and shales of the Campbell rand series, and the jaspers and magnetic quartzite of the Griquatown series. As the top of the dome has been denuded down to a generally level area, the overlying formations mentioned above are now exposed as outcrops lying very roughly in concentric bands around the granitic area. To the south and south-west of the granite the dip gradually decreases and becomes more or less horizontal so that there is in this direction an enormous exposure of the Campbell rand formation consisting chiefly of dolomite. The great expanse of flat country with which we are dealing consists almost wholly of the granite area to the north-east surrounded on the south, south-west and west by the dolomite region which forms the vast flat expanse known as the Kaap Plateau. The other formations are represented chiefly by narrow bands of hilly country. In the granite area the true rock is seldom exposed, excepting along the lowest portions of the river valleys. Elsewhere it is covered over to a depth of generally 100 to 130 feet of decomposed granite, granite wash, calcareous tufa and surface sand or sandy loam. In the dolomite region, on the other hand, there is generally very little surface covering the lumpy masses of dolomite, showing up everywhere on the veld through the thin covering of soil.

To the north and north-east of Vryburg, and again at Mafeking there are extensive flats formed of diabase and amygdaloidal rocks which are of later origin than the granite and have considerable development in the Transvaal. The tract described as the granitic area is traversed by three belts of ferruginous, cherty and schistose rocks. These belts are considered to be the last remains of a once extensive formation, but the belts are now narrow and not continuous. They are parallel to one another, and have generally a N.N.W. to S.S.E. trend.

The eastern belt passes through Madibi; the central belt stretches from Pitsani, on the Molopo River, across the Maritsani River to Kraaipan on the railway; the western belt is only well defined near Mosita. All the belts are highly metalliferous and also auriferous to some extent.

The above is a very general geological description of the tract under consideration, and for a more detailed study of the geology of the country the reports of the Geological Commission for 1905, 1906, 1907 and maps Nos. 49, 50 and 52 must be consulted.

(10) *The Kaap Plateau.*—The great Kaap Plateau as a whole is described as follows by Mr. A. W. Rogers in the Annual Report of the Geological Commission for 1906. It is a roughly triangular area with its base stretching from Vryburg westwards to Tsinen, on the Kuruman River, and its apex near the Orange River, at Read's Drift, an area of over 6,000 square miles.

"The Plateau appears to be remarkably flat to a person travelling across it in any direction, and the shallow dry valleys on its surface have so slight a slope that it is some-times difficult to decide the direction of fall. There are few hills on the plateau, and these usually have gentle slopes, and do not rise more than 100 feet above the surface in their neighbourhood. Towards the western side there are a few abrupt hills in the area where chert is more abundant than in other parts of the plateau.

"The highest point on the plateau is probably the hill on which the beacon "Khaw" stands, 5,032 feet, and the valley of the Kuruman River below the Magistrate's house is probably under 3,900 feet; the edge of the plateau between Vryburg and Campbell lies about 4,000 feet, or slightly above that level. The difference in level, therefore, at various parts of the surface is over 1,000 feet, but they are brought about so gradually that the Plateau appears to be flatter than it really is.

"The eastern limit of the Plateau is the escarpment trending a little east of south from Vryburg to the Griqualand West boundary near Taungs, and thence in a more westerly direction to the Orange River near Read's Drift."

(11) The surface of the plateau is well covered with grass and occasionally with bush. It is generally very uneven, owing to the presence of projecting lumps of chert and dolomite. These lumps project sometimes as much as two feet above the soil. Travelling in an ox-wagon over this country is very trying. In other areas surface or tufaceous limestone appears above the soil every few feet.

The soil covering is generally very thin, seldom exceeding a few inches, excepting in the shallow valleys or laagtes where pockets of deep black vlei soil are met with. Pans are numerous, and have in most cases floors of dolomite rock; in others the floors consist of soft white tufaceous limestone. Towards the western side of the plateau the surface becomes more sandy. A very striking feature of the whole dolomite region are the so-called "aars" which extend in straight lines for miles. They form narrow parallel ridges rising from 5 to 20 feet above the general level of the country. They invariably support a dense growth of thorn trees which throw them into great prominence, as the flat intervening country is generally devoid of trees or bush, being merely grass-covered or bare.

These ridges are generally capped with calcareous tufa. These "aars" owe their origin in most cases to dykes of dolerite or other igneous rock traversing the dolomite. These dykes are very numerous in the Kaap Plateau, though the rock itself is very rarely seen, excepting occasionally as fragments of dolerite or diabase near or on the ridge.

Like the "aars," the pans are also made conspicuous by a dense growth of trees and bush which grow on the sloping ground around their margins. Where these slopes are gentle the belt of growth is sometimes of very considerable width, and so thick as to make progress through it difficult. The pan itself is generally circular and covered with a white calcareous alluvium and always completely devoid of vegetation.

In some parts the dreary monotony of the flat and treeless veld is relieved by the presence of numerous patches of dense tree and bush growth. These patches are slightly elevated and consist of surface lime. They are generally small in area, sometimes only being a few feet in diameter.

(12) The grazing veld is comparatively poor. The soil covering is, where is exists at all, so thin that it can hold but a little supply of moisture and the vegetation suffers accordingly. The grass is coarse looking, and large areas traversed by me were mainly clothed with wild lavender which was in full bloom. The rainfall during the summer is fitful, and is seldom sufficiently constant to maintain enough moisture in the shallow depth of soil to obviate the partial or complete withering of the grass after a shower has caused it to shoot up. Veld-burning is generally practised. This has only had the effect of deteriorating the vegetation and of exterminating any natural tree growth excepting along the "aars," around pans, along the margins of laagtes in some places, in the little patches above referred to and generally in all cases where spring water is near the surface in sufficient quantity to maintain the growth of vegetation in spite of veld-burning.

The shortcomings of the grazing veld are to some extent compensated for by more promising conditions in the laagtes or valleys, and by the presence of certain oases owing their existence to springs.

(13) The granitic area is with few exceptions buried under thick superficial deposits of sand, sandy loams, calcareous tufa, rock exposures being very uncommon. The surface is covered with tall grasses and, where not burnt, with dense bush and forest growth which gives it a much more pleasing and varied appearance than is the case with the Kaap Plateau.

Some portions are very flat, and where the trees have been burnt off, the scene is as monotonous and dreary as the sandy road is heavy. Where covered with thick bush the flatness is not so noticeable. Some portions are gently undulating, and when wooded at the same time the effect is most pleasing.

The country will be described in greater detail further on, and I will now deal briefly with the Hydrographic conditions of the country.

Rainfall in Bechuanaland.

(14) The rainfall records for Bechuanaland are very meagre, and are practically confined to Mafeking and Vryburg, where gauges of long standing exist. The following is a complete list of rain gauges which are now read or which have been read in the past, together with particulars regarding their institution or abandonment. Considering the two Mafeking gauges as one station there have thus been 10 rain gauges installed in Bechuanaland from time to time, of which eight are now being recorded, but most have been read for too short a period to be of much direct use.

Name of Station.	Fiscal Division.	Year in which instituted.	Years of continuous record.	Remarks.
Mafeking "The Home stead"	Mafeking ...	1889 ...	15 years ...	Private gauge. No returns since '04. Somewhat remarkable divergence between the two gauges at Mafeking.
Mafeking (Gaol) ...	Do. ...	1898 ...	6 years ...	Gaol gauge not read during the war.
Setlagoli (Gaol)	Do. ...	1903 ...	4 years ...	
Zwartlaagte		1904 ...	3 years ...	
Vryburg (Gaol)	Vryburg ...	1886 ...	16 years ...	Record incomplete during several years
Taungs (Gaol)	Do. ...	1898 ...	8 years ...	Do. do.
Morokwen	Do. ...	1898 ...	Nil ...	Destroyed during the war and not restored.
Doornbult	Do. ...	1898 ...	Nil ...	Do. do.
Reitzdale	Do. ...	1907 ...	1 year ...	Instituted by Irrigation Department.
Masilibetsani	Do. ...	1907 ...	Nil ...	Do. do.
Kuruman	Kuruman ...	1905 ...	3 years ...	

The annual totals for each of the stations for which a complete year's record exists are given in the statement attached, and the positions of all the gauges are shown on the map at the end of his report. It will be seen that long records exist only for two stations along the eastern margin of Bechuanaland. An attempt has been made to deduce the average rainfall over the central and western portions of the country from the long records of the eastern stations by comparing monthly totals of stations wherever available. Thus we can compare he monthly totals of Morokwen and Doornbult during the greater part of 1898 with the corresponding totals at Mafeking and Vryburg, and similar comparisons have been made for

the years 1907 and 1908 between the old stations and the new ones at Reitzdale, Masilibitsani and Setlagoli. Though it is perhaps a little rash to make a deduction of this kind yet I should say that the variation in rainfall between different portions of Bechuanaland is but small. It appears to be somewhat less in the west and south-west than in the north and north-east. The rainfall is heaviest at Mafeking and diminishes slightly towards the south and south-west, and possibly towards the west, though the records which we have are too scanty to prove this to be the case. The rainfall would, therefore, seem to diminish regularly with the fall of the country towards the west and south-west, Mafeking being situated close to the watershed.

Year.	Mafeking.	Settlagoli.	Zwartlaagte (Boschkop.)	Reitzdale.	Morokwen.	Masilibitsani.	Vryburg.	Taungs.	Doornbult.	Kuruman.
1889	...	...	...	...	Instituted in 1898 and destroyed during the war in 1899. Read for 18 months but records for full calendar year not available.	Instituted in 1907.	20·84	...	Institutel in 1898, and destroyed in 1899. Read for nineteen months, but record of full year not available.	...
1890	28·49	...	...	...			...	...		...
1891	42·00	...	...	...			...	...		...
1892	31·11	...	...	...			24·98	...		...
1893	30·44	...	...	...			26·01	...		...
1894	28·68	...	...	...			25·44	...		...
1895	29·70	...	...	...			...	...		...
1896	16·01	...	...	...			17·93	...		...
1897	20·10	...	...	...			11·06	...		...
1898	24·01	...	...	...			18·90	20·19		...
1899	23·11	...	...	...			...	...		...
1900	27·36	...	...	...			...	...		...
1901	21·42	...	...	...			27·01	25·21		...
1902	18·32	...	...	...			18·05	13·73		...
1903	18·00	...	...	...			11·87	11·89		...
1904	25·19	25·88	...	...			24·25	22·13		...
1905	22·94	10·19	10·22	...			18·20	20·40		18·88
1906	22·83	20·64	22·49	...			20·98	18·23		18·43
1907	24·65	26·74	...	23·64			24·96	23·13		21·15
1908	19·76	11·85	12·53	11·96			15·99	15·82		12·00

As a general rule the months of June, July and August are rainless throughout Bechuanaland. Light rains are received in September and monthly totals increase slowly, reaching their maximum during the months of January, February and March. During April and May the monthly totals diminish rapidly again.

Though much is heard of the decrease in the rainfall during recent years, the truth of this assertion cannot be proved from available records. Taking the last seven triennial periods we obtain the following averages:

1887 to 1889.	1890 to 1892.	1893 to 1895.	1896 to 1898.	1899 to 1901.	1902 to 1904.	1905 to 1907.	
...	33.87	29·61	20·04	23·96	20.50	23.47	Mafeking
20.03	...	...	15.96	...	16.39	21.38	Vryburg.
...	...	...	...	...	18.92	20.59	Taungs.

It is a great pity that there are so many breaks in the Vryburg record, as this gauge is really the oldest of any. From the statistics available it appears that from 1890 to 1895 the rainfall was much above the general average, but that otherwise it cannot be said that the rainfall over the

country has decreased within recent years. The six rainy years no doubt made a great impression upon the people, but old residents continually refer to the heavy rains in 1891 and 1892 in a manner which shows clearly that it was exceptional. Thus Mr. Kinnear, an old resident at Sidilimolmo on the Molopo River, stated with regard to this dry water course that it ran permanently for many years prior to 1896, since when it has been dry, but that he remembers it being dry in 1886 which goes to show that a period of unusually heavy rainfall intervened. Considering the precariousness of the rainfall in other portions of the Colony, more especially on the Karroo, there is little doubt that Bechuanaland is a much favoured country.

In considering the question of rainfall and its effect on the country it is necessary to look into conditions along the western margin of the Transvaal, immediately adjoining Bechuanaland.

Here again we are handicapped by the shortness of the record. In the Marico, Lichtenburg and Bloemhof districts of the Transvaal no less than 32 gauges have been established, but none of these appear to have been established prior to 1904.

The district averages are as follows: —

District	1904.	1905.	1906.	1907.
Marico	26·36	16·21	21·98	28·55
Lichtenburg	23·85	16·29	20·41	26·93
Bloemhof	21·65	18·34	16·64	26·44

From this it would seem that there is little difference between the rainfall on either side of the Transvaal-Bechuanaland Border.

The rainfall of 1909 promises to equal or exceed that of the wettest year on record.

Run-off.

(15). Though the rainfall over Bechuanaland is very considerable the run-off is very small indeed. With the exception of the area drained by the Hartz River none of the rain falling on the country ever reaches the sea. In years of heavy precipitation there is a certain amount of flow in the rivers, and in past years some rivers are said to have flowed throughout the year. This was the case with the Molopo during the very wet years between 1890 and 1895. In the Mafeking Division and the eastern portion of the Vryburg Division there is considerably more "run-off" than in the western portions of the country which is entirely due to geological peculiarities. A glance at the Geological Commission's maps of this area shows clearly that the outcrop of rock is mainly confined to the eastern margin of the country, whereas by far the greater portion is buried beneath a thick covering of surface deposits of a coarse and exceedingly absorbent character. Thus we have a considerable flow after good rain in such streams as the Maritzani, Setlagoli and Mosita Rivers, especially in their upper reaches, but there is very seldom any flow in their lower reaches or beyond their junction with the Molopo which has been a dry river below Mafeking ever since 1896.

During the latter end of September, 1907, I was touring along the Maritzani River immediately after a very heavy and general fall of rain. On the farm Buckreef the Maritzani ran for three days, the depths of water in the river channel attaining a maximum of three feet. On the 26th September the river had ceased to flow at Buckreef. On the following day I proceeded down the river and on crossing it five or six miles lower down was astonished to find that no flood water at all had reached this spot. The same thing was noted on the Setlagoli which is a much bigger river than the Maritzani. On small selected areas a low

run-off is generally obtained when local geological conditions favour it, but over any large area there is no run-off at all, all water soaking into the ground. This extreme porosity of the surface makes the conservation of water by means of ordinary earthen dams, with a very few exceptions, impossible, but this question will be dealt with fully later on.

UNDERGROUND WATER.

(16). As stated in the last paragraph the surface drainage is generally not available for use, as excepting along portions of some of the bigger rivers, whose valleys have not yet been covered with thick layers of silt and where more impervious strata lie near the surface, there is as a rule no stream flow.

Speaking generally, for stock and domestic purposes reliance must be placed upon underground water and upon springs where such exist.

The presence of underground water depends largely upon geological formations, and a study of these is essential in order to understand the conditions under which water is found and may be expected to be found. Mr. Alex. L. du Toit, Geologist on the staff of the Geological Commission, is the only expert who has studied the subject from the geologist's point of view, and his paper read before the South African Philosophical Society (Trans: Vol. XVI., Part 3) in 1906 is a valuable contribution on the subject.

Mr. Du Toit also submitted a report to Government upon the water resources of the First Railway Grant in June, 1907. The former paper deals generally with the fiscal Divisions of Mafeking and Vryburg and Kuruman as far west as the Village of Kuruman, and most of the following information is taken from that paper.

(17). By digging shallow pits in the beds of the rivers the natives obtain water; curiously enough, water appears to be absent in certain reaches and is found again at points further down the valleys. Why this should be so is not evident; possibly the water may make its way beneath one or other of the banks either along an old and now-buried channel or along cracks and fissures in the rocks.

According to Penning,* a somewhat analogous phenomenon exists in the lower portion of the Molopo River north-westward from Kuruman; his notes on the underground water of this part of the Kalahari, and also of the region still further to the west, afford very considerable and interesting information.

A rather curious feature, confined to the granite area, is the occurrence of what are known as "sand wells." By sinking a pit in the sand a little water collects at the bottom; on deepening the excavation the water level does not remain stationary, but falls considerably, and the supply is soon exhausted. These "sand wells," curiously enough, are often productive at points quite high up on the sides of granitic ridges.

GROUND WATER.

From the soil the seepage gradually makes its way downwards into the underlying rock, and the depth to which the water will penetrate will depend upon the nature of the rock, its porosity, degree of decomposition, the existence of joints, etc.

In addition there is the slow but regular movement of the ground water towards those parts of the country having a lesser elevation. In this the movement is aided by fissures, channels or "veins" of varying width, along which the water can more readily travel than through the

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* W. H. Penning, "Gold and Diamonds," Chaps. IV. and V., London, 1901.

pores of the rock. Though it is an open question whether these "veins," which make water-boring in many cases so uncertain an operation, can be located by human agency, there are, nevertheless, various surface indications that may influence a person in making a selection of a site.

(i). *Topography.*—It is usual, of course, to choose a site at as low a level as will be convenient, yet sometimes, paradoxical as it might appear, this may not be the best situation. For example, supposing we have the common case of a wide flat crossed by a deepish river-valley, it is not unusual to find that a well sunk near the centre of the flat will give a better supply, and that also at a shallower depth, than will be obtained at points on the slope not far from the river-bed. This is due to the rapid fall of the water-table towards the line of drainage below the river channel.

As far as possible ridges and watersheds should be avoided, for the area that can be drained by a well in such a position is invariably small, and the proportion of rainfall absorbed by the soil is much lower than on the flats. A troublesome strip of country is the main watershed, and the wells along it are considerably deeper than elsewhere. The normal scarcity of water is intensified by the existence of a belt of compact quartz-porphyry.

(ii). *Dykes, Faults, etc.*—It is not uncommon to find shrubs clustered thickly together along a certain line with such regularity as to produce a narrow belt resembling an artificial plantation. These "aars," as the Dutch farmers call them, may extend in straight lines for miles, and are due to several causes.

Basic igneous dykes may give rise to these phenomena, and in most cases wells sunk on their outcrops give good supplies of water. The effect may be produced by quartz reefs, but they are not very plentiful here, and the underground circulation is therefore not appreciably influenced by them.

Sometimes, on sinking, no foreign rock is met with, but there is a zone of crushed and decomposed material along which the water makes its way; this is not unusual in the granite area.

In the dolomite areas such "aars" form narrow ridges a few feet higher than the surrounding country; they are generally capped with calcareous tufa, and support a thicker vegetation than elsewhere.

(iii). *Calcareous Tufa.*—Patches of soil are very frequently found covered by a deposit of calcareous tufa of greater or less thickness. In many cases this points to the presence of water at no great depth.

In the dolomite area, and again in that occupied by diabase and amygdaloid, the carbonate of lime is derived by direct solution from the former rock, and by the decomposition of the minerals in the latter. Moisture containing the carbonate in solution is drawn up to the surface by capillary forces, and by evaporation the tufa is formed. In many cases the rims and floors of pans are composed of a similar deposit.

Sometimes, however, the carbonate of lime is brought down by rivers which take their rise in a dolomite area, and the tufa so formed is deposited upon any kind of rock and may therefore be no indicator of underground water.

(iv.) *Pans and Vleys.*—These depressions are extremely numerous throughout the district, and vary from a few yards to over a mile in diameter; they exist on nearly every formation.

These pans hold water for a certain period during the rainy season; all of them dry up during the winter.

Experience has shown that a well sunk within or upon the edge of a pan usually gives a good supply of water at a shallow depth. The reasons for this are threefold: firstly the underlying rock, being kept

moist, tends in consequence to decompose and become more porous; secondly, as the level of the pan is often at quite an appreciable depth below the surrounding country, moisture gravitates towards the depression; and thirdly, owing to seepage from the pan itself, the level of the water-table beneath and immediately around the pan is usually higher than elsewhere.

For abundance of supply it would be difficult to beat the little depression on the farm Water Pan between Vryburg and Genesa; the underlying rock consists of a very much decomposed and highly porous granite.

Brak pans, which are so characteristic of that portion of the Kalahari north of Upington, are practically unrepresented in this district; the exceptions are Groot and Klein Chwaing.

(v.) *The Junction of Two Formations.*—It is rather surprising that so little advantage is taken of the occurrence of water at the junction of two dissimilar sets of rocks. For example the base of the Black reef series is markedly water-bearing, and fine springs occur at Vryburg and at Motiton.

There is one drawback to boring, namely, the excessively hard formation, which is almost impenetrable with ordinary drills.

Effect of the Formation.

Over most of Bechuanaland the soil is sandy and of considerable depth, yet there appears to be but little of the water stored in it that can be made available. Consequently it is to the underlying rock that one has to turn, and as the nature of it may vary it is of great importance to discover the effect of the geological formation.

This will be briefly considered below:—

(*a*) *Granite and Gneiss.*—This formation is hardly ever well exposed, and is usually covered with a mantle of reddish sandy soil.

The granite and gneiss are more or less decomposed, and this alteration extends below the surface to a rather variable depth; the more micaceous gneissic varieties are usually altered to a greater degree than the compact unfoliated granites.

In boring, as long as the core brought up shows cavities and fissures, or the felspars are clouded or kaolinised, there is always a possibility of obtaining water. If, however, the core shows a perfectly sound, fresh, compact granite, it may be advisable to stop. In some cases the apparently solid rock has contained numerous minute cavities, hardly visible to the naked eye, and the borehole has yielded a considerable supply.

The more compact varieties of granite—and in this category we may include quartz-porphyry—will in most cases yield but little or no water. A formation of quartz-porphyry, such as that between Vryburg and Genesa, should as far as possible be avoided.

In boring or sinking spots should not be chosen where the granitic rock forms marked outcrops, and by preference sites should be selected where there are pans on the formation.

Generally speaking, the granite is a most uncertain rock in which to bore for water, and failures may continually be expected.

(*b*) *The Diabase Formation.*—This commonly forms flattish ground, and from it excellent supplies of water are obtained as a rule, sometimes from remarkably shallow depths. Especially is this so in depressions and pans and along stream-courses.

The formation, which is composed principally of igneous material, consists of layers of differing composition and texture, while much of the lava is amygdaloidal.

Down to a certain depth the diabase is full of cavities and fissures, but beyond that, at a distance of a few hundred feet below the surface, the rock becomes massive, and the finer grained varieties may be absolutely waterless. We have, for example, a dry borehole over 500 feet deep in this formation at Vryburg Station.

(c) *The Dolomite.* This, as a rule, provides the best water supply, and fortunately is a formation of great thickness and one covering a vast area.

Water is usually met with not many feet below the surface, and on the flats between Vryburg and Kuruman there are several places where open water exists all the year round. Springs are not uncommon, and from them, in not a few places, abundant, and in some cases inexhaustible, supplies of water have been obtained.

The rock is well bedded and traversed by numerous joints, which have often been widened by atmospheric agencies and solution.

This produces a condition favourable to the downward passage of water; but if the process has gone on extensively, it may lead to the transference of the water to deeper levels.

There is no evidence as yet to show whether the movement of the underground water in the dolomite is considerable or rapid. This is a point of the utmost importance, for the rainfall in the east is very much higher than that in the west, and any transference of water from east to west will increase the underground supply in the region of lower rainfall.

WATER IN THE KAAP PLATEAU—THE KURUMAN SPRING.

(18). On page 26, *et seq*, of the report of the Geological Commission for 1906, Mr. A. W. Rogers deals with the question of water in the Kaap Plateau, and writes as follows:—

> The dolomitic limestones of the Kaap are traversed by many narrow passages, along which water may still flow. The remarkable spring at Kuruman, which yielded, according to a measurement made by me in September, 1906, 5¼ million gallons a day, issues from the base of a low krantz of limestone, but it receives additions from springs which rise from the sandy bottom of the pool below the krantz. There is a hole on the west side of the mass of limestone forming the krantz, down which one can drop into a passage behind the krantz. A considerable part of the passages is dry at the present time, and judging from the amount of earthy matter lying on the dry floor, some considerable time may have elapsed since water flowed over these parts. Neither the floor nor the roof maintains the same level for any considerable distance. The width of the passages varies considerably, and at most is about 8 feet. Though the walls, which have an inclination towards the south of west, are in many places coated with a deposit of carbonate of lime, there are few well developed stalactites; those which were once there have been broken off.
>
> There are said to be other caves or passages in the Kaap Plateau, on the Kono Reserve and Kogel Fontein. The strong springs which issue from the level ground on the Manyeding and Groot Vlak Fontein Reserves, and on Bothetieletsa, may well come from similar fissures in the limestone. Near Geluk there is a well-like hole through shaly limestones, in which water stands at a level of about 17 feet from the surface. The supply was maintained when 270,000 gallons a day were being pumped out.
>
> Springs are more numerous and yield a larger volume of water in the plateau than in any other part of the area between the escarpment and the Langeberg Range. In several places I was assured that these springs do not yield as much as they did a few years ago, and on several farms the springs marked on the Divisional map were not flowing in 1906. With regard to the Kuruman spring, there is no evidence to decide whether the flow is less than in former years. The people in Kuruman say that the flow is constant throughout the year, and from year to year also. There is, however, a dry channel, not long deserted, at a slightly higher than the present exit of the main spring, and unless the water which once flowed along the higher channel has found a lower exit, the flow must have decreased.

The Kuruman spring issues at a spot which lies at a comparatively low level, and its position is such that it would be possible for the water which falls on a very large part of the Kaap Plateau to find exit there. The geological structure of the country is also such that the limestone strata, so favourable to the development of underground channels of considerable width, dip gently towards the Kuruman hills from the east; therefore, if there were any obstacles, such as impervious beds, faults, dykes, or vertical masses of chert, which impede the flow of water westwards under the Kuruman hills, it would issue on the east side of those hills. My survey failed to discover any such impervious body of rock or dislocation likely to intersect the westward flow of the water from the plateau, and so I cannot assign a reason for the occurrence of the spring at the particular spot where it issues. There can be little doubt, however, that the water at Kuruman and the other smaller springs on the plateau comes eventually from rainfall on the plateau. All these waters are very hard; their temperature is above the air temperature on a cold day and below it in hot weather; at Kuruman, the water was at 64° F. at the drift in July and November.

There is no such strong spring as the Kuruman fountain at any other place on the east flank of the Kuruman-Asbestos range, though small springs are not infrequent. Near Daniel's Kuil there are dykes of dolerite traversing the dolomite approximately parallel to the strike of that rock. These dykes (possibly the isolated outcrops belong to one and the same dyke) are probably responsible for the appearance of the fairly strong supply of water at the surface at Daniel's Kuil village. In this part of the plateau the drainage lines run eastwards, towards the escarpment on the Vaal River Valley, and the conditions are therefore less favourable to the occurrence of a large quantity of water than at Kuruman. The springs and wells near Daniel's Kuil were plainly showing in 1906 the effects of deficiency in rainfall during the past ten years.

The hole in the ground from which Daniel's Kuil got its name may originally have been similar in nature to the waterhole (called the Wondergat) at Geluk; but the Daniel's Kuil is dry, and there is no record of its ever having had water in it. Both holes certainly owe their existence to the removal of rock by solution. In the case of Daniel's Kuil, the limestone is no longer visible in the hole, which is now about 15 feet deep, and in process of being filled with rubbish; the walls are made of a reddish earthy material, and they recede some feet from the opening, which is through a hard ferruginous gravel.

(19). As regards the Kuruman Spring the flow was estimated by Mr. Edwards of the Public Works Depar ment some years ago to be approximately 3 million gallons per day. On the 22nd October, 1907, I made careful discharge observations of the stream issuing from the Kuruman "Eye," 3,500 feet below it, and found it to be 7'6 cubic feet per second or 4,104,000 gallons per 24 hours. It is almost impossible to obtain accurately the discharge by ordinary methods of observation, as the stream is nowhere concentrated in a suitable channel, and to gauge the whole stream over a notch would involve very considerable expenditure of money, but until this is done it is impossible to judge whether the stream issuing from the "eye" varies to any considerable extent or not.

(*To be continued*).

THE DEHORNING OF CATTLE.

Simple Method of Restraining the Animals.

[The following article by R. W. Hickman, V.M.D., Chief of the Quarantine Division, Bureau of Animal Industry, U.S.A. (U.S. Department of Agriculture, Farmers' Bulletin, 350), should prove of interest to South African cattle farmers.]

The dehorning of cattle can be very satisfactorily performed without other apparatus or instruments than a good strong clothesline and a clean sharp meat saw, or a mitre saw with a rigid back. The same simple means for controlling the animal is just as applicable when dehorning clippers are to be used as when the horns are to be removed with the saw. The head of the animal is secured to the horizontal rail or stringer which holds the upper ends of the stanchion boards. The animal is put in the stanchion in the usual manner; then one end of a heavy clothesline is passed around the upper part of the neck and tied in a knot that will not slip, otherwise it will choke the animal. The free end of the rope is now carried between the horns, through the stanchion to the front, up and over the horizontal stanchion rail, then down underneath the neck and up and over the top of the stanchion rail to an assistant, who should hold it firmly. Now open the stanchion, allowing the animal to withdraw its head; then, keeping the rope tight, pass it once around the muzzle, up and over the stanchion rail, and through to the front again to the hands of the assistant, who should stand 3 or 4 feet in front of the animal and hold the rope firmly, but prepared to release it when told to do so by the operator. The animal is now ready for the dehorning operation.

It is necessary that the rope be held by an assistant, as in the event of the animal struggling during the operation so as to throw itself off its feet, or if there appears to be danger of its choking, the rope may be slackened promptly at the word of the operator and the animal partly released. This, however, is rarely necessary, for as soon as the head is secured the operator should be ready, standing at the right shoulder of the animal with his saw, and proceed to saw off first the right and then the left horn. Figure one shows the animal and the operator in position for the dehorning operation by this method. It is a good plan before commencing the real work to experiment upon an animal in the matter of control by tying the head to the stanchion rail as described.

If the stanchion rail is too wide to permit of properly securing the lower part as well as the upper part of the animal's head, the turn of the rope around the muzzle may be omitted and the last lap of the rope carried around the stanchion rail to the front and to the hands of the

assistant. Care should be taken that the rope pass each time over the neck of the animal to the stanchion rail between the horns in such a way that it will not interfere with the work of the saw.

Where to Cut the Horns.

The horns should be severed from a quarter to a half inch below where the skin joins the base of the horn, cutting from the back toward the front.

If the cut is made too high an irregular, gnarly growth of horn is very apt to follow. It will be seen that the point of union of the skin and horn varies in different cattle; hence there can be no rule of measurement, except as the eye becomes trained to see the point or line at which the cut should be made. In the beef breeds fully one-half inch of skin, all around, is usually taken off with the horn.

Fig. 1.—Method of tying cow to stanchion rail.

Figure 2 illustrates the difference between a proper and an improper cutting, and figures 3 and 4 show the appearance of animals' heads after proper and improper dehorning.

Instruments for Dehorning.

In recent years, since dehorning shears or clippers have come into use, this means of dehorning is considered by some cattle owners to be preferable, especially where large numbers of cattle are to be dehorned. One type of dehorner has a stationary knife blade, with its cutting edge shaped like a very wide V, and opposing this another knife of similar shape, moving in a slide, so that the cutting edges cut the horn from all four sides at once, all the edges passing the centre at the same time. Another type has a movable knife with one oblique or one curved edge, and the cutting is done in one direction only. The power for cutting with these instruments is supplied by pulling together two long handles, which, in order to transmit a greater force, are generally so constructed that they act through the medium of a series of cogs.

In dehorning with these instruments the opening between the cutting edges should be slipped down over the horn and the knives closed so that their edges set firmly against the horn in such a position that the cut will be made in the right place and in the right direction. The blades should be kept covered with a thick oil or grease. The handles should be drawn together with a quick, firm, strong pull, so that the horn will be completely severed by the first act and without twisting. Care should be taken to keep the blades sharpened on their original bevel.

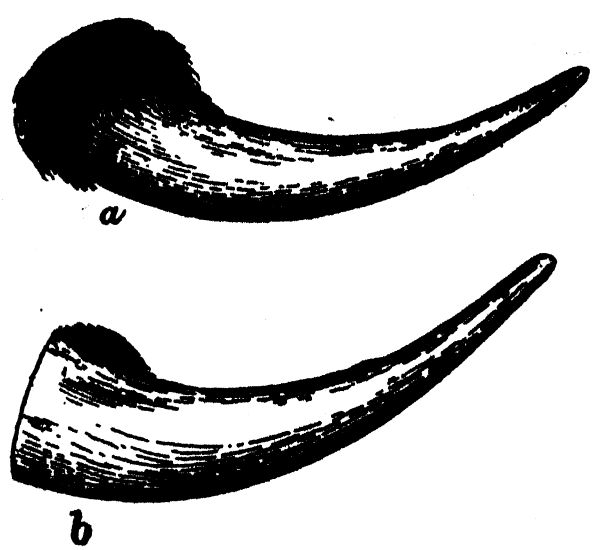

Fig. 2.—Horns showing (a) proper and (b) improper cutting.

Dehorning instruments can be procured of the manufacturers and of dealers in veterinary instruments.

There was published in the report of the New Zealand department of agriculture for 1904 a description of the operation of dehorning cattle by the government veterinarian at New Plymouth, in which it was shown that a cage had been used for the restraint of the animals during the operation, closely resembling the box used for hoisting horses out of ships, this cage being hauled on a wagon from farm to farm as needed. In discussing the various means for the removal of the horns the report was very favourable to the use of the saw in dehorning full-grown cattle. It was stated that in the dehorning of over 10,000 cows with the saw there were no deaths due to the operation, while in cows dehorned by shears there was trouble afterwards in healing of the wounds, due, no doubt, to the crushing, fracturing action which this instrument has upon old horns, where ossification of the cores is advanced. Because of this condition it was recommended that for mature animals a bone saw be used.

Fig. 3.—Head of steer showing result of proper dehorning.

Treatment after Dehorning.

It is not usual to apply any preparation after the operation of dehorning to prevent bleeding, as the loss of blood is not sufficient, as a rule, to be of consequence. Care should be taken, however, to prevent substances from getting

into the openings left after the horns are removed. The horn cores are elongations of the frontal bones of the skull and are hollow. They communicate with the frontal sinuses, or air spaces, of the head; therefore foreign substances or fragments of horn which act as an irritant in these cavities are apt to set up an inflammation, resulting in the formation of pus or an abscess, which may prove quite serious. This trouble is of infrequent occurrence, but would appear more liable to happen when the dehorning instruments are used, on account of their tendency to crush, especially in the case of old animals, whereas the saw cuts clean. If proper care is taken, however, such an occurrence following dehorning may in almost every instance be avoided.

Fig. 4.—Head of steer showing results of improper dehorning.

Occasionally animals after being dehorned and turned out of the stable will rub their heads against a dirt or gravel bank or the rough bark of a tree, and foreign material may thus get into the cavities, though usually the soreness of the parts is sufficient to prevent this.

If the animals are dehorned in warm weather, it is well to apply some pine tar (Stockholm tar) with a view to keeping flies from the wounds. Some operators do this in nearly all cases, thinking that it facilitates healing. The dehorning operation should always, when possible, be performed in cool weather, and upon animals which have at least attained the age of two years.

Is Dehorning Cruel?

Inquiries are frequently received as to whether the operation of dehorning is very painful, and whether it may not be classed as cruelty to animals. Those who have had an extensive experience in dehorning appear to agree that the pain induced by the operation has been greatly overestimated, as careful observation has shown that shrinkage in the yield of milk as well as of butterfat following the dehorning of cows is very temporary and insignificant. On the other hand, the worry, pain, and cruelty often inflicted by cattle upon their mates before being deprived of their horns is much more to be considered, and not infrequently results in the death of a valuable animal. A neighbour on an adjoining farm to that owned by the writer a few years ago lost two good milch cows in one winter through their being disemboweled by the horns of barnyard mates while out for exercise. He dehorned his entire herd almost immediately afterwards. The increased safety of the animals much more than compensates for any loss of beauty resulting from the removal of horns.

To Prevent Horns Growing on Young Calves.

When circumstances are favourable, as in the case of farmers who build up their herds by raising the progeny, the horns may be prevented from growing by a simple and practically painless method, and the custom of preventing the growth of the horns is becoming more popular and more generally practised under all conditions except in the case of calves dropped on the open range. The calf should be treated not later than

one week after its birth, preferably when it is from three to five days old. The agent to be used may be either caustic soda or caustic potash, both of which may be procured in the drug stores in the form of sticks about the thickness of an ordinary lead pencil and 5 inches long. These caustics must be handled with care, as they dissolve the cuticle and may make the hands or fingers sore. The preparation of the calf consists in first clipping the hair from the parts, washing clean with soap and warm water, and thoroughly drying with a cloth or towel. The stick of caustic should be wrapped in a piece of paper to protect the hands and fingers, leaving one end of the stick uncovered.

Moisten the uncovered end slightly and rub it on the horn buttons or little points which may be felt on the calf's head, first on one and then the other, alternately, two or three times on each, allowing the caustic to dry after each application. Be very careful to apply the caustic to the horn button only. If it is brought in contact with the surrounding skin it will cause pain. Be very careful also not to have too much moisture on the stick of caustic, as it will remove the skin if allowed to run down over the face. After treatment, keep the calf protected from rain, as water on the head after the application of caustic will cause it to run down over the face. This must be carefully avoided.

Either caustic soda or caustic potash alone, without the admixture of other substances, answers the purpose satisfactorily. Some years ago, however, certain preparations or "dehorning compounds," composed largely of one or the other of these caustics, were generally used, and as inquiries are still occasionally received concerning such preparations, the following formula is given: Combine in an emulsion 50 per cent. of caustic soda, 25 per cent. of kerosene, and 25 per cent. of water. The caustic soda is dissolved in the water and heated to the boiling point, then removed from the fire, and the kerosene added gradually, while the mixture is vigorously stirred. This emulsion is applied in very much the same manner as the stick caustic, except that it is necessary to employ a short, stiff brush. Sometimes a meat skewer is used, the large end being mashed to form a stubby brush. Two or three applications should be made to each horn button, as in the case of the stick caustic, with intervals to allow it to dry.

In the very young calf the horn button, or point that will ultimately develop into a horn, has scarcely any attachment to the skull, and may be felt as a small button embedded in the skin. In this early stage it may be easily removed with a sharp knife or a pair of curved scissors, but even then caustics should be applied to kill any remaining cell life belonging to this germ point; otherwise there may be some subsequent irregular horn growth, which is more or less of a disfigurement.

SEED FOR EXPERIMENTAL PURPOSES.

The Department of Agriculture is prepared to distribute a limited quantity of the undermentioned seeds, free of charge to *bona fide* farmers in the Colony for the coming sowing season. These seeds are intended solely for purposes of experiment, and in making application, the following conditions must be borne in mind:—

(1) Only applications reaching this office up to and including the 31st October, 1909, will receive attention. After that date it is proposed to discontinue distribution until the autumn sowing season of 1910, commencing on the 1st March next.

(2) Each recipient of seed undertakes faithfully to furnish this Department with a report showing the result of the experiment on a form provided for the purpose, and enclosed with letter advising despatch of seed. In the past when an experiment has failed farmers have been under the impression that a report was unnecessary, but, on the other hand, the negative report from an experimental point of view is just as valuable as the successful one. It will, doubtless, be a matter of surprise to farmers who have the welfare of the country at heart to learn that last season 1,300 (one thousand three hundred) applicants were furnished with various varieties of seed, and of those only *240 (two hundred and forty)*, equal to 18½ per cent., took the trouble to send in a report. Seed distribution under these circumstances is simply a waste of money, and applicants are urged to faithfully carry out their obligations and do their share of the bargain. In future no seed will be furnished to any farmer who fails to furnish a report in due course. It is, therefore, imperative that, no matter what the result, a report must be furnished this Department on the report forms provided for this purpose.

(3) Not more than five varieties will be supplied to any one applicant, but should it happen that the varieties applied for exceed in cost a certain amount to be arranged by the Department, the numbers of varieties forwarded will be reduced, at the discretion of the Department, so that the cost of the same is within the fixed limit. This has been found necessary on account of the lack of funds, but it is only in a few cases where the cost of the seed applied for is very high that it is likely this course will be resorted to.

(4) As it is felt that many farmers will require seed for special reasons, such as (*a*) a grass considered suitable for sowing in vleis, (*b*) for winter feeding for ostriches, sheep, cattle, etc., or the opposite, viz., summer feeding, and for various other special purposes, it is agreed that if farmers apply for seed giving the special conditions under which they expect the plants to grow, and for what classes of stock and at what season of the year they desire to have a crop for the special purpose in view, and do not name any particular varieties, the officer in charge of this work will recommend and send what seed he considers will do best under the circumstances from past experience gained both in this and other countries. It must, however, be understood that the matter will still be purely experimental for many reasons, and that the officer advising is doing so from his knowledge of the plant in question, its habits, and the peculiar conditions under which it has flourished and the purpose for which it has been used in this and other countries. Directions are herewith published

for the sowing of the various seeds offered. These directions are subject to alteration from time to time as more experience is gained, which must necessarily follow, owing to the great variation in climatic conditions and soil all over the Colony. At the same time this publication of directions will obviate the necessity of sending directions for sowing to each individual applicant, as he must necessarily have seen the directions in the same *Journal* from which he has obtained the names of the seed required.

(5) The attached form should be torn out, filled in and addressed to the Government Agriculturist, Department of Agriculture, Cape Town.

Name of Applicant
Address ....

District ....
Name of Railway Station to
which seed must be sent ....
Varieties required (1) ....
(2) .... (3)
(4) .... (5)
Date ...., 190.

It will be noticed that a number of the seeds appearing on the list are recommended for winter crops. This means that these should be sown in autumn, and farmers desirous of obtaining them are strongly advised to make application during the autumn distribution, commencing 1st March, 1910.

LIST OF AGRICULTURAL SEEDS FOR DISTRIBUTION, 1909 (SPRING) SEASON: SHOWING QUANTITY OF EACH VARIETY AVAILABLE FOR ANY ONE APPLICANT.

In some cases limited quantities only are available. Early applications will therefore receive preference.

Grasses:

- Italian Rye Grass (Lolium Italicum) ... ... 5 lbs.
- Perennial Rye Grass (Lolium Perenne) ... ...
- Devon Evergreen Rye Grass ...
- Tall Oat Grass (Arrhenatherum Avenaceum) ... ... 2 ,,
- Cocksfoot (Dactylis Glomerata) 2 ,,
- Tall Fescue (Festuca Elatior Sub Sp. Arundinacea) ... ... 2 ,,
- Paspalum Dilatatum ... ... 2 ,,
- Natal Red Top Grass (Tricholoena Rosea) ... ... ½ lb.
- Bushman Grass (Aristida Ciliata) Tall ... ... 1 oz.
- Bushman Grass (Aristida Obtusa) Short ... ... 1 oz.
- Rescue Grass (Bromus Uniloides) 2 lbs.
- Meadow Rice Grass (Poa Sempervirens) ... ... 1 oz.
- Meadow Grass, Kentucky Blue Grass (Poa Pratensis) ... 1 oz.
- Red Fescue (Festuca Rubra) ... 2 lbs.
- Sheeps Fescue (Festuca Ovina)... 2 ,,
- Towoomba Canary Grass (Phalarais Commutata ?) ... ... 1 oz.
- Perennialised Italian Rye Grass 6 oz.
- Teff Grass (Eragrostis Abyssinnica) 2 lbs.
- Guinea Grass (Panicum Maximum) 2 ,,
- Eleusine Coracana... ... ... 2 ,,
- Blaauwzaad (Eragrostis Curvula) 2 ,,
- Bermuda Quick Grass (Cynodon Doctylon) ... ... 2 ,,
- Meadow Fescue (Festuca Pratensis)... ... ... 2 ,,

Root Crops.—

Mangolds (Beta Vulgaris):

- Long Red ... ... 2 lbs.
- Yellow Globe ... ... 2 ,,
- Golden Tankard ... ... 2 ,,
- Orange Globe ... ... 2 ,,
- Giant Half Sugar White ... 2 ,,

Sugar Beet (Beta Vulgaris):

- Vilmorins Improved ... ... 2 ,,
- German ... ... ½ lb.

Turnips (Brassica Compestris):

- Early Six Weeks ... ... 1 lb.
- Snowball ... ...
- White American Straw Leaf ...
- White Stone ... ...
- Purple Top Mammoth ... ...
- Green Globe ... ...

Carrots (Daucus Carota):
- White Belgian Cattle — 1 lb.

Swedes (Brassica Rutabaga L.):
- Webb's Imperial — 1 lb.
- Giant — 1 „
- Monarch — 1 „

Leguminosae.—

Beans:
- Scotch Horse Bean (Vicia Faba) — 2 lbs.
- Tick Bean „ „ — 2 „
- Port Natal Bean — 2 „
- Locust Bean (Ceratonia Siliqua) — 1 lb.
- Velvet Bean (Mucuna utilis) — 1 „
- Soja Bean (Glycine Hispida) — 1 „
- Swazi Bean — 1 „

Vetches (Vicia Sativa):
- Spring — 4 lbs.
- Winter — 4 „

Clover (Trifolium):
- Broad Red (Trifolium Pratense) — 3 „
- Giant Cow Grass (Trifolium Pratense Perenne) — 3 „
- Dwarf White (Trifolium Repens) — 3 „
- Giant White „ „ — 3 „
- Alsyke (Trifolium Hybridum) — 3 „
- Crimson (Trifolium Incarnatum) — 3 „
- Japanese (Lespedeza Striata) — ½ lb.
- Alexandrian (Trifolium Alexandrinum) — ½ „
- Yellow Sand (Anthyllis Vulneraria) — ½ „

Lucerne (Medicago Sativa):
- French Dodder Free — 3 lbs.
- Turkestan — 3 „
- Medicago Arborea — 3 „
- Do. Media — 3 „

Tagasaste (Cysus proliferus) — 1 lb.

Sainfoin (Onobrychis Sativa):
- Giant Milled — 1 lb.
- Common — 1 „

Sulla-Spanish (Hedysarum Coronarium) — 2 lbs.

Serradella (Ornithopius Sativus) — 1 lb.

Lupins:
- White (Lupinus Albus) — 3 lbs.
- Yellow (Lupinus Luteus) — 3 „
- Blue („ Angustifolius) — 3 „

Cowpeas (Vigna Catjang):
- Zwartbekje — 2 lbs.
- New Era — 2 „
- Coffee — 2 „
- Calico — 2 „
- Whip-poor-will — 2 „

Melilot:
- Yellow Flowered (Melilotus Officinalis) — 2 oz.

Sorghums:
- Planters Friend — 3 lbs.
- Early Amber Cane — 2 „
- Imphee — 1 lb.
- Oklahoma Broom Corn — 1 „

Millets:
- Japanese (Panicum Crusgalli) — 3 lbs.
- Pearl { (Pennisetum typhoideum. Rich. Penicillaria Spicata). } — 2 „
- Nyouti (Pennisetum typhoideum) — 3 „
- Boer Manna (Setaria Italica) — 3 „
- Egyptian (Pennisetum typhoideum) — 1 lb.
- Japanese Barnyard (Panicum Crusgalli) — 1 lb.
- Hungarian (Setaria Italica) — 1 „
- Cat Tail Pearl (Pennisetum typhoideum) — 2 lbs.

Maize:
- Cinquantina (very small) 7 weeks — 3 lbs.
- Hickory King — 3 „
- Brazilian Flour — 3 „
- Pride of the North — 2 „
- Sweet Fodder Corn — ½ lb.
- Evergreen Late Sugar Corn — ½ „
- Snow White Dent. — 3 lbs.
- Six Weeks or Quarantine of Naples — 3 „
- Leaming Early — 3 „
- Extra Early Dwarf Sugar Corn — ½ lb.
- Manifold — 3 lbs.
- Early Mammoth Sweet Corn — 2 „
- Early Yellow Canada — 2 „
- Golden Beauty — 2 „
- Thoroughbred White Flint — 2 „
- Long White Flint — 2 „

Teosinte — 3 „

Melons:
- Tsama — 1 oz.
- Monketaan — 1 „
- Kaffir Mammoth White — 1 „

Calabash — 1 „

Miscellaneous.—

Rape:
- Dwarf Essex — 3 lbs.
- Summer — 3 „
- Winter — 3 „

Flax Riga — 3 „

Hemp — 1 lb.

Kale:
- 1000-headed — lb.
- Hardy Branching

Chou Moeillier

Castor Oil Red Stalked

Sunflower, Tall Russian — lbs.

Chicory, Short Brunswick — lb.
- Magdeburg

Mustard, White

Helianti — 2 oz.

Salt Bushes:
- Artiplex Semibaccatum — 2 lbs.
- „ Nummalaria — 1 lb.
- „ Halemoides — 2 lbs.
- „ Vesicarium — ½ lb.
- „ Campanulata — ½ „
- „ Leptocarpa — ½ „
- „ Nuttallii — ½ „
- „ Canescens (Shad Scale)
- „ Pabularis (Nelson's)

Burnet — 1 „

Cotton, American Rattler — 1 „
- Egyptian-Abas-i — 1 „
- Mitaffi — 1 „
- South Sea Cotton—St. Vincent Sea Island — 1 „
- Selected "Sterling S," Barbados Sea Island — 1 „

Tobacco, Hester — ½ oz.
- Gold Finder
- Turkish Bafra

American Kentucky Burley

Virginian Seed Leaf

Draaibosch (Diplopappus filifolius) — 1 „

Karoo Bush (Pentzia Virgata) — 1 lb.

TABLE OF REFERENCE FOR CROPS.

Variety of Seed.	Drilled.	Broadcast.	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Grasses.						lbs.	
Italian Rye (Lolium italicum).	...	Broadcast	...	Winter, annual or perennial.	February to May.	18—30	Should be sown in damp hollows and vleis in the West. One of the best grasses for sheep, cattle and horses. Suitable for hay making, withstands a great amount of cold. Comes to maturity rapidly in early spring and gives feeding throughout the winter. Requires a fair amount of moisture, either rainfall, irrigation, or flood water. It may be termed a biennial on account of self-seeding (if left).
Perennial Rye and Devon Evergreen Rye (Lolium perenne).	...	Broadcast	...	Winter perennial.	February to May.	20—30	Not so particular as to soil as Italian Rye, but most suited to damp clay soils. Two of the finest grasses for hay. Suited for cattle, horses, and sheep, giving a good winter feed. Requires quite as much moisture as Italian Rye.
Tall Oat (Arrhenatherum Avenacum).	...	Broadcast	...	Winter perennial only under very favourable conditions.	January to May.	14—29	Soil most suited to this variety should be one of light character. Suitable for grazing for stock and also for hay making. Withstands a fair amount of frost and cold.
Cocksfoot (Dactylis glomerata).	...	Broadcast	...	Winter and summer perennial.	February to May & September to November.	10—15	Should be sown in moist districts or with a rainfall of 20" upwards. If rainfall is scarce, should be irrigated. Soils best suited are alluvial or rich clays, but also does well on hillsides of poorer nature. Makes an excellent pasture grass for sheep if not fed too freely the first year. Is better suited to mixed pastures. Very good hay can be made from it. For the purpose of hay it should be cut young, just when flowering. Stands severe cold and has done very well in some of the coldest districts of the Colony.

Variety of Seed.	Drilled.	Broadcast.	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Grasses-contd.						lbs.	
Tall Fescue (Festuca elatior).	...	Broadcast	...	Winter perennial.	February to May.	12—15	Rejoices in moist soil, preferably vlei ground, but is quite as good a drought resistant as lucerne, if not more so. Is a fast grower and yields good hay if cut when coming into flower. Suitable for all classes of stock for grazing. One of the finest winter grasses yet introduced. Remains green throughout the year and withstands cold and frost in a marked degree.
Paspalum dilatatum.	...	Broadcast	Summer perennial.	...	September to March.	10—12	Although frost cuts it down in winter it comes on again in the spring with first rains. Prefers moist, rich soils, although it grows in soils of all descriptions. A splendid grass for grazing for all stock; the more it is fed the quicker it stools out. Makes a splendid hay if cut when flowering. Ostriches take to it well. Can be sown in seed-bed and planted out 2 feet apart all ways. Spreads very rapidly under favourable circumstances, *i.e.* most seasons. One of the most popular grasses ever introduced into the Colony—for the South, West and East Coast Districts.
Natal Red Top (Tricholœna rosea).	...	Broadcast	Summer perennial.	...	August to October.	10—15	Produces a dense mass of succulent foliage in spring, which remains until cut down by frost. Withstands drought and can be grown on poor soil. Strong grower, attaining height of 3 feet 6 inches, and should be cut for hay when in flower. Suitable for all stock when young and especially suited as a green food for poultry. Owing to its beautiful appearance when in flower it is often grown as an ornamental grass.
Bushman Grass.	...	Broadcast	Summer ...	...	Spring and Summer.	...	Drought resistant.

			tity ... er acre.	ark
Grasses-contd.			lbs.	
Rescue Grass (Bromus unioloides).		... to May August.	20—25	The hardiest winter grass known in the Colony, standing heavy frosts. Requires moisture to a certain extent, and a fertile soil to give good results. Seeds in September or October and quickly dies off. It is to be found in most of the gardens all over the Colony.
Meadow Rice (Poa sempervinens).	Winte	May.	15—20	A very rich grass, creeping in habit. Stands frost well. Requires a certain amount of moisture. Is more suitable to grazing than for hay. Not particular as to quality of soil.
Meadow Grass (Poa pratensis).	Winter	h to M	15—20	Similar in most respects to the above.
Red Fescue (Festuca Rubra).			...	
Sheeps Fescue (Festuca Ovina).			...	Not sufficient data to enable the drawing up of di present.
Toowoomba Canary Grass (Phalaris commutata ?)	Winte	uary to May Augus be	...	This grass has only recently been introduced and has withstood 12° frost. It stools well, preferring rich soil, but grows on poor soil and matures in early spring. Very suitable for hay making or green food for cattle. Only small quantities will be distributed owing to the high price of seed at present, but with a little care and attention one season will produce enough seed and plants to allow of extensive experiments. Seed beds should be kept moist and after the seedlings are up the grass can be treated like paspalum. See *Agricultural Journal*, January, 1909.)

Variety of Seed.	Drilled.	Broadcast.	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Grasses—contd. Perennialised Italian Rye Grass.	...	Broadcast	...	Winter perennial.	February to May.	lbs. 15—20	New hybrid being introduced for first time this season.
Teff Grass (Eragrostis Abyssinica).	Drilled	Broadcast	...	...	March, April, August and September.	Thickly	As this is the first season this grass has been tried in the Colony the quantity per acre will have to be determined by experience and also the quality of soil required. It is used in its native country as a cereal, the grain producing flour of extreme whiteness, but its use in the Colony will be as a fodder plant. It makes excellent hay and is suitable for horses and cattle. It prefers light soils and does very well on sand. It matures quickly in three to four months.
Guinea Grass (Panicum Maximum).	...	Broadcast	...	Perennial ...	...	...	Requires a long season and is susceptible to frost. Requires warm weather to ripen seed. Should be cut frequently prevent it becoming too coarse. Grows to 6 or 8 feet.
Eleusine Coracana.	...	Broadcast	...	Annual ...	...	...	Annual. Very nutritious. Rapid grower. Well liked by stock. Does well in high altitude.
Blaauwzaad (Eragristis Curvula).	...	Broadcast	...	Perennial ...	Spring ...	10	Strong growing drought resistant grass. Grows well almost anywhere. Prefers damp, well worked soil.
Bermuda or Quick Grass (Cynodon Dactylon).	...	Broadcast	...	Perennial ...	...	...	Useful for covering bare or barren land. Resists drought. Difficult to oust from arable lands if once established.
Meadow Fescue (Festuca Pratensis).	...	...	...	Winter perennial.	...	...	Grows well in almost any situation. Seeds germinate readily. Makes good hay, much relished by stock.

Variety of Seed.	Drilled.	Broadcast.	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Root Crops.						lbs.	
	The ground for root crops should be well and deeply ploughed. All these crops should be thinned out to allow of their attaining a good size if sown direct in the field.						
Mangles and Sugar Beet.	Drilled (drills about 24–30" apart).	...	Summer and Winter biennial		August, September, February, March, April.	5—8	Owing to the thickness of the gulls of these seeds they should be soaked in water for 12 hours before sowing. If transplanted from a seedbed at a distance of 3 feet by 1 foot an acre will take about 16,000 plants. If sown in drills the seeds should be dropped about three inches apart, and when in the 3rd leaf stage thinned out to about 12 ins. apart. Moist and heavy soils are preferable. Frost resistant.
Turnips and Swedes.	Drilled 18–24" or	Broadcast	Summer and	Winter annual	August to October, March to May.	4—6	Should be sown in lighter land than mangolds and when up thinned out to about 9 to 12 inches apart. Frost resistant.
Carrots ...	Drilled 12–18" or	Broadcast	Summer and	Winter annual	February to April. August to October.	6—8	Sow in in soil well tilled and free of weeds. Seed should be just covered by the soil. Soil best suited is one of a light nature well manured. When up they should be thinned out to about 6 feet apart.
Leguminosae.							
	These crops are all rich in nitrogen and will improve the quality of the soil in this respect. Many plants of this order require a fair percentage of lime in the soil to give the best results, and if this ingredient is absent it will be as well to apply it as a manure in one form or another, with the exception of serradella, to the growth of which too much lime is detrimental.						
Beans ...	Drilled	...	Summer annual.	...	September to February, August to September.	40—50	Sow in drills 2 ft. 6 ins. apart, the seed to be dropped about 2 feet apart and 1 inch deep. In the East it is better to sow in January or February to escape the ravages of the Bean beetle (Mylabis). Sensitive to frost.

Variety of Seed.	Drilled.	Breadcast.	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Leguminosae—contd.						lbs.	
Vetches Spring and Winter.	...	Broadcast	Summer and	Winter annual	September and March, August and April.	30—40	Valuable as hay and green manuring or as grazing for sheep and cattle. Requires a certain amount of warmth and moisture. For hay it should be cut as it comes into flower. Is not affected by frost.
Clovers.							
Broad Red Giant Cow Dwarf White Crimson Japanese Alexandrina Yellow Sand Giant White Alsyke.	Drilled 8-24" apart, or	Broadcast	Summer perennial. Annual Perennial do.	...	January to May. August to September.	15—20	These clovers require moisture to grow to any extent, and thus have so far proved more successful in the East than in the West. Japanese clover stands drought the best. Suitable for grazing cattle and sheep, and for hay making when cut in bloom. Very suitable for feeding to ostriches. The same treatment as is required for lucerne, only more moisture is necessary.
Lucerne ...	Drilled 8-24" or	Broadcast	Summer perennial.	...	January to April and August to September.	15—20	In the Eastern Province where weeds are very troublesome in the summer, the lucerne should be sown in drills in autumn, and in summer kept cut until the lucerne gains the upper hand. Suitable to graze all classes of stock, including ostriches. Makes one of the finest hays in the world. Should be cut for hay when about 10% of the crop, is in bloom.
Medicago Arborea } Medicago media. }	...	...	...	...	...	...	Separate directions will be supplied for this crop at a later date.
Tagasaste ...	Drilled	...	Summer and	Winter perennial.	September to November and February to May.	...	Prior to sowing seed should have boiling water poured over it and left in the water for 24 hours to facilitate germination. It should be sown in drills 3 to 6 feet apart to allow of cultivating between rows. Suitable for all stock but should be left for a couple of years before cutting back. Splendid drought resister.

Variety of Seed.	Drilled.	Broadcast.	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Clovers-contd.						lbs.	
Sainfoin ...	Drilled 16-18" apart.	Broadcast	Summer perennial.	...	February to May or September to October.	About 30 lbs. clean seed, 4 bushels rough seed.	Heat and moisture are essentials for this crop. Soil of a light sandy nature, rich in lime is the most suitable. Good feed for horses and cattle. If cut just before coming into flower it makes excellent hay. Crop should be treated in most respects like lucerne.
Sulla... ...	Drilled 15" to 2' apart, or	Broadcast	Summer and	Winter perennial.	February to March preferably or September to October.	If drilled 8-10 lbs., if broadcast about 15-20 lbs.	This crop grows well in late autumn and early spring. Makes very good hay if cut before flowering and is good food for all classes of stock. Its apt to get coarse if not cut soon enough. This crop should be treated in most respects like lucerne but grows during the off season of lucerne.
Lupins ...	Drilled 15".	Broadcast	Summer and	Winter annual	September to November or March to May.	50—70	Risk by severe frost should be avoided while the crop is still young. Soil most suited is one of a sandy nature. It is chiefly used as a green manure. One of the richest fodders, but is not relished on account of its bitter flavour. Should not be allowed to seed before it is ploughed in.
Serradella (Ornithopus salivus).	Drilled 15-18" apart.	Broadcast	Summer and nial where severe.	Winter perenfrost is not too	September to October or January to May.	15—30	Prefers a moist loose limeless soil. A good feed for all stock and makes good hay. This crop may be treated in most respects like lucerne.
Cowpeas ...	Drilled 3' apart.	...	Summer annual.	...	August, September, October.	9—12	Prefers a loose, sandy loamy soil, but grows well on heavy soils. Heat is an essential to the good growth of this crop. Suitable as a green crop for ploughing under, also for food for dairy cows. Sensitive to frost. Ground should be deeply ploughed.
Melilotus officinalis.	Drilled about 18" apart.	Broadcast	Summer ...	...	September, October.	15—20	Requires a limey soil. It will last for more than one year if cut before it flowers. Will withstand about the same degree of cold as lucerne.

Variety of Seed.	Drilled.	Broadcast.	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Sorghum, Millets and Maize.						lbs.	
For these crops the ground should be well prepared and deeply ploughed.							
Sorghum ...	Drilled 3' apart, or	Broadcast	Summer annual.	...	September, October.	10—60	Requires a certain amount of moisture. Is a splendid green food for dairy cows, and makes good ensilage. The grain can be used as a feed for fowls. When green the stalks if cut up can be fed to ostriches. Stands drought better than maize when once established. Sensitive to frost.
Millets Boer Manna.	...	...	...	...	...	...	May be sown later than other millets as being susceptible only to heavy frosts it stands a greater degree of cold than the other varieties.
Maize ...	Drilled 3' apart.	Broadcast	Summer annual.	...	September and October.	20—50	Suited for making hay, ensilage, or for grain. In the East, where the mealie grub is troublesome, it is advisable to sow in December, so as to escape, to a certain extent, the ravages caused by this pest. If growing for grain thin out to a foot apart. Sensitive to frost.
Teosinte (Euchlaena Luxurians).	Drilled 3' apart.	...	Summer annual.	...	September, October, July to August.	2—4½	Is a stout, leafy plant and yields an enormous amount of green food suitable for dairy cows. Cannot stand the slightest frost. Treat in the same manner as mealies. When up thin out to a foot apart.
Melons and Gourds.	All these are very susceptible to frost.						
Tsama ...	Drilled 6' all ways.	...	Summer annual.	...	September to November.	...	Soil most suited and one in which it revels is of a light nature and alluvial. It requires plenty of heat. In its natural haunts, the Kalihari Desert, it grows when the rains fall, from January to April.
Monketaan ...	Drilled 6'.	...	Summer annual.	...	August, September to November.	...	Suitable food for cows and pigs. Grows well on sandy soil and stands drought well.

Variety of Seed.	Drilled.	Broadcast.	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Sorghum, Millets and Maize—contd.						lbs.	
Calabash Pipe Gourds.	Drilled 5′.	...	Summer annual.	...	August. September. July to August.	...	Should not be sown on too rich a soil, otherwise the gourds grow too coarse and are not suitable for pipe bowls. Light soil is most suited for this crop, although it grows well on heavy soils, though often too luxuriantly on the latter.
Miscellaneous Crops.							
Rape	Drilled 2 to 3′.	Broadcast	Summer and	Winter	August to March.	4—8	This fodder, in conjunction with lucerne, gives an ideal food for ostriches. Cattle and sheep eat it with great relish. Requires a good, rich soil and certain amount of moisture. If sown for ostriches 6 to 8 lbs. seed is required, otherwise 4 to 5 will be found sufficient. In putting cattle and sheep on it for the first time, care should be exercised not to let them on it if it is wet, and only when the edge has been taken off their appetites. Withstands frost in a marked degree.
Kale	Drilled 3′.	Broadcast	Summer and	Winter	September to March and April.	4—5 lbs. if broadcast.	Is a fine feed for cattle and also for sheep and ostriches. May be sown in seed beds and transplanted 3 feet all ways. An acre will then take 4,840 plants.
Flax	Drilled and	Broadcast	...	Winter ...	March to May.	10—15	The seeds are very suitable for feeding to young calves. Prefers a sandy soil and moist climate.
Chicory ...	Drilled or	Broadcast	Summer ...	...	September. July. August.	2—8	The green food has been found suitable for cattle, sheep and ostriches. Almost any soil is suitable, but the lightest sands and heaviest clays should be avoided. Prefers a moist climate. If sown broadcast 8 lbs. seed is required, but if in drills 2 inches apart only 2 lbs. is required. It should then be thinned out to 9 inches apart. If wanted for the root the crop should be lifted when the lower leaves begin to turn yellow, and the roots will break clean though still in the milky stage.

ariety Seed.	Drill	Summer Crop.	Winter Crop.	Season for Sowing.	Quantity of Seed per acre.	Remarks.
Miscellaneous Crops—contd.					lbs.	
Mustard ...	Drill	Summer and	Winter	September to January to May.	8—10	Suitable green food for cattle and sheep, and when young has proved excellent for young ostriches. The conditions are the same as in the case of rape.
Sunflower	led	Summer ...	...	August to November.	10—12	The ground best suited to this crop is one of a light nature, well tilled and manured. When up should be thinned out to 16 to 24 inches apart. Subsequent treatment is the same as for mealies. It should not be sown until all danger of frost is past. Seeds are good food for poultry and ostriches.
Heli		...	...	...	...	A new crop now tried for first time in S. A. It is described as growing to height of 6 feet—can be cut twice a year.

PEANUTS.

This crop should be sown when all danger of frost is passed, July and August in the West and September and October in the East. Heat and moisture are absolute essentials for the success of this crop. It takes from three to six months to ripen. The nuts may be planted in ridges or on the flat. Constant cultivation during growth is also essential to obtain the best results. The nuts are planted according to variety, *i.e.*, Running Virginian are planted 2 nuts in each hill 32 feet apart both ways, whereas upright varieties may be planted 8 to 14 inches apart and the rows 3 feet apart. The upright varieties, such as Virginian Bunch, require the least labour in harvesting. Should be harvested before the first signs of frost, and then the ground should fall clear of the nuts like potatoes. The crop is ploughed up in the morning and stacked in small heaps in the afternoon. The method of stacking is as follows:—A pole is planted in the ground and the crop stacked with roots to the centre on cross poles, laid on the ground round the pole. These stacks must be protected from rain, and in 20 days should be dry enough to pick.

CASTOR OIL.

Prepare the soil as for mealies. Seed should be drilled in 7 to 8 feet (smaller varieties may be placed closer), and 2 feet in the row. The seed should be soaked for 18 to 24 hours previous to sowing in order to procure even germination. Two seeds are put into each hill, and the weaker plants are removed when about 8 to 10 inches high. When 3 to 4 inches high they should be moulded up with a double mould-board plough. Seeds are picked when pods are a reddish brown to a peculiar green colour. When picked, the pods should be placed on a floor in the sun, and there will burst and throw out seed. No moisture must reach the seed during this process. Some varieties appear more sensitive to frost than others.

SALTBUSH.

The amount of seed varies as to method of sowing. About 2 to 2½ lbs. is required. The seed is best sown in early spring. Semibaccatum and nummularia will resist frost in a marked degree, especially the latter, These two varieties are perennial.

COTTON.

Prepare the land as for mealies. The best time for sowing has not been actually ascertained, and can only be done by local experience, but in the West August appears to be the best, when the picking season will come about December to February. In the East, on the other hand, September to October will be the best, bringing the picking season to April and May, when it is dry, and before the frost starts. This plant cannot withstand frost, and the sowing must be regulated accordingly. The seed should be sown in rows according to variety, *i.e.*, Sea Island about 5 feet apart, other varieties 3—4 feet. Five seeds should be planted in each hill, and the hills 12—15 inches apart. When the young plants are about 14 days old the weakest should be removed, leaving the two strongest in each hill. Fourteen days later the weaker of these remaining two plants should be removed, and any vacant places filled with the strongest of the weak ones removed. Cotton requires fertile soil.

CANNING VEGETABLES IN THE HOME.

SOME AMERICAN METHODS.

There are very few sections of this country where vegetables cannot be grown at some season of the year, however short that season may be. But there are fewer still where vegetables are obtainable the year round, however desirable. To meet these conditions our farmers wives should go in for canning as they do in other countries. A recent U.S. Farmer's Bulletin (No. 35) written by J. F. Breazeale, gives the following full details of the process:—

THE SCIENCE OF STERILIZATION.

The art of canning or preserving in one form or another is almost as old as history itself. The early Chinese possessed this secret long before the era of modern civilization, but "the reasons why" which lay back of the art have only recently been thoroughly explained.

The great secret of canning or preserving lies in complete sterilization. The air we breathe, the water we drink, all fruits and vegetables, are teeming with minute forms of life which we call bacteria, or molds, or germs. These germs are practically the sole cause of decomposition or rotting. The exclusion of air from canned articles, which was formerly supposed to be so important, is unnecessary provided the air is sterile or free from germs. The exclusion of air is necessary only because in excluding it we exclude the germ. In other words, air which has been sterilized or freed from germs by heat or mechanical means can be passed continuously over canned articles without affecting them in the least. If a glass bottle is filled with some vegetable which ordinarily spoils very rapidly—for instance, string beans—and, instead of a cork, it is stoppered with a thick plug of raw cotton and heated until all germ life is destroyed, the beans will keep indefinitely. The air can readily pass in and out of the bottle through the plug of cotton, while the germs from the outside air can not pass through, but are caught and held in its meshes. This shows that the germs and their spores or seeds are the only causes of spoilage that we have to deal with in canning.

Germs which cause decay may be divided into three classes—yeasts, molds, and bacteria. All three of these are themselves plants of a very low order, and all attack other plants of a higher order in somewhat the same way. Every housewife is familiar with the yeast plant and its habits. It thrives in substances containing sugar, which it decomposes or breaks up into carbonic acid and alcohol. This fact is made use of in bread making, as well as in the manufacture of distilled spirits. Yeasts are easily killed, so they can be left out of consideration in canning vegetables. Molds, like yeasts, thrive in mixtures containing sugar, as well as in acid vegetables, such as the tomato, where neither yeasts nor bacteria readily grow. Although more resistant to heat than yeasts, they are usually killed at the temperature of boiling water. As a general rule,

molds are likely to attack jellies and preserves and are not concerned with the spoiling of canned vegetables. The spoiling of vegetables is due primarily to bacteria.

Bacteria are also much more resistant to heat than yeasts. They thrive in products like milk and in meats and vegetables rich in protein, such as peas, beans, etc. All known species of molds require air in which to work. This is not true of bacteria, certain species of which will live and cause vegetables to decompose even when no air is present. When these particular species are present the exclusion of air is no safeguard against decay, unless the vegetable is first thoroughly sterilized. Bacteria are so small that they can only be seen with a microscope, and they reproduce themselves with amazing rapidity. One bacterium under favourable conditions will produce about twenty millions in the course of twenty-four hours. Accordingly certain vegetables spoil more rapidly than others, because they furnish a better medium for bacterial growth.

The reproduction of bacteria is brought about by one of two processes. The germ either divides itself into two parts, making two bacteria where one existed before, or else reproduces itself by means of spores. These spores may be compared with seeds of an ordinary plant, and they present the chief difficulty in canning vegetables. While the parent bacteria may be readily killed at the temperature of boiling water, the seeds retain their vitality for a long time even at that temperature, and upon cooling will germinate, and the newly formed bacteria will begin their destructive work. Therefore it is necessary, in order to completely sterilise a vegetable, to heat it to the boiling point of water and keep it at that temperature for about one hour, upon two or three successive days, or else keep it at the temperature of boiling water for a long period of time—about five hours. The process of boiling upon successive days is the one that is always employed in scientific work and is much to be preferred. The boiling on the first day kills all the molds and practically all of the bacteria, but does not kill the spores or seeds.

As soon as the jar cools, these seeds germinate and a fresh crop of bacteria begin work upon the vegetables. The boiling upon the second day kills this crop of bacteria before they have had time to develop spores. The boiling upon the third day is not always necessary, but is advisable in order to be sure that the sterilisation is complete. Among scientists this is called fractionable sterilization, and this principle constitutes the whole secret of canning. If the housewife will only bear this in mind she will be able with a little ingenuity to can any meat, fruit, or vegetable.

Exclusion of the Air.

Even after sterilization is complete the work is not yet done. The spores of bacteria are so light that they float about in the air and settle upon almost everything. The air is alive with them. A bubble of air no larger than a pea may contain hundreds of them. Therefore it is necessary after sterilizing a jar of vegetables to exclude carefully all outside air. If one bacterium or one of its spores should get in and find a resting place, in the course of a few days the contents of the jar would spoil. This is why the exclusion of air is an important factor, not because the air itself does any damage but because of the ever-present bacteria.

All of this may seem new fashioned and unnecessary to some housekeepers. The writer has often heard it said: "My grandmother never did this, and she was the most successful woman at canning that I ever knew." Possibly so, but it must be remembered that grandmother made her preserves—delicious they were, too—and canned her tomatoes, but did not attempt to keep the most nutritious and most delicately flavoured vegetables, such as lima beans, string beans, okra, asparagus, or even corn (mealies).

Kinds of Jars.

The first requisite for successful canning is a good jar. Glass is the most satisfactory. Tin is more or less soluble in the juices of fruits and vegetables. Even the most improved styles of tin cans which are lacquered on the inside to prevent the juice from coming in contact with the tin are open to this objection. While the amount of tin dissolved under these conditions is very small, enough does come through the lacquer and into the contents of the can to be detected in an ordinary analysis. While the small amount of tin may not be injurious, it gives an undesirable color to many canned articles. Tin cans can not readily be used a second time, while glass with proper care will last indefinitely.

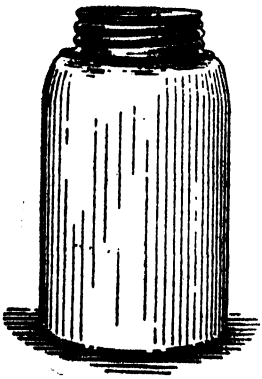

Fig. 1.—Mason Jar.

There are a great many kinds of glass jars on the market, many of them possessing certain distinct points of advantage. The screw-top, or Mason, is the one in most common use (fig. 1). Although cheap in price, these jars are the most expensive in the long run. The tops last only a few years, and being cheaply made, the breakage is usually greater than that of a better grade of jar. The tops also furnish an excellent hiding place for germs which makes sterilization very difficult. An improved type of screw-top jar is shown in fig. 2. These are fitted with a glass top held in place by a metal cover which screws down over the neck of the jar. If the canning or sterilization is conducted properly, practically all of the air will be driven out of the jar by the steam. Upon cooling, this is condensed, a vacuum is formed on the inside which clamps down the glass top against the rubber ring and seals the jar automatically. The metal cover can then be removed, as the pressure of the outside air will hold the glass top securely in place.

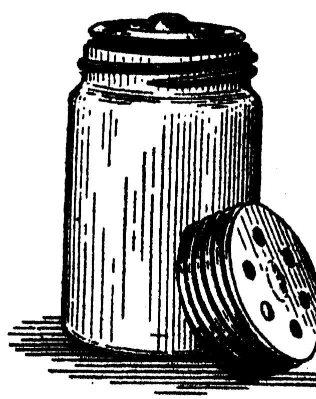

Fig. 2.—Improved Mason Jar.

Another type of jar in common use is shown in fig. 3. These require no rubber rings, but are fitted with a metal top, lacquered on both sides and having a groove around the lower edge. This groove contains a composition of the consistency of rubber which is melted during canning by the heat of the jar and forms a seal that takes the place of the rubber ring. These metal tops must be renewed each year, as it is necessary to puncture them in order to open the jar.

The most satisfactory jar that the writer has had any experience with is the one shown in figs. 4, 7, 8, and 9. This has a rubber ring and glass top which is held in place by a simple wire spring. There are several brands of these jars on the market, so no difficulty should be experienced in obtaining them. Vegetables often spoil after being sterilized because of defective rubbers. It is poor economy to buy cheap rubbers or to use them a second time. As a general rule, black rubbers are more durable than white ones.

Buy a good grade of jar. The best quality usually retails at from a dollar to a dollar and twenty-five cents a dozen. The initial expense may be, therefore, somewhat high, but with proper care they should last many years. The annual breakage should be less than 3 per cent. on the average. In selecting a jar always give preference to those having wide mouths. In canning whole fruit or vegetables and in cleaning the jars the wide mouth will be found to be decidedly preferable.

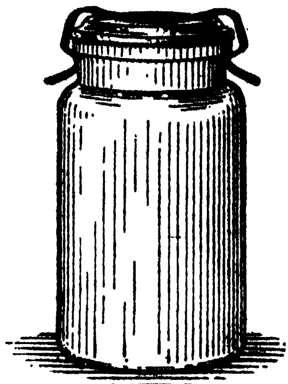

Fig. 3.—Jar with metal lacquered top.

Containers for Sterilizing.

The writer uses a tin clothes boiler with a false bottom made of wire netting cut to fit it (fig. 5). The netting is made of medium-sized galvanized wire (No. 16) with one-half inch mesh. A false bottom is absolutely necessary, as the jars will break if set flat upon the bottom of the boiler. Narrow strips of wood, straw, or almost anything of this nature may be used for the purpose, but the wire gauze is clean and convenient.

There are several varieties of patent steamers or steam cookers in common use. These have either one or two doors and hold a dozen or more quart jars (fig. 6). They are ideal for canning, but they are somewhat expensive and can be easily dispensed with. A common ham boiler or clothes boiler with a tight-fitting cover will answer every purpose.

Selection and Preparation of Vegetables.

The first step in successful canning is the selection and preparation of the vegetables. Never attempt to can any vegetable that has matured and commenced to harden or one that has begun to decay. As a general rule, young vegetables are superior in flavour and texture to the more mature ones. This is especially true of string beans, okra, and asparagus. Vegetables are better if gathered in the early morning while the dew is still on them. If it is impossible to can them immediately, do not allow them to wither, but put them in cold water or in a cold, damp place and keep them crisp until you are ready for them. Do your canning in a well-swept and well-dusted room. This will tend to reduce the number of spores floating about and lessen the chances of inoculation.

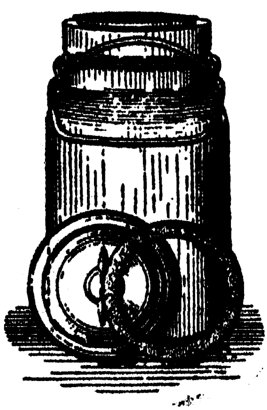

Fig. 4.—Spring-top Jar.

In the following pages are given directions for canning some of the more common vegetables, but the housewife can add to these at will. The principle of sterilization is the same for all meats, fruits, and vegetables.

Corn (Mealies).

Contrary to the general opinion, corn (green mealies) is one of the easiest vegetables to can. The United States Department of Agriculture has shown that the amount of sugar in the sweet varieties diminishes very rapidly after the ear is pulled from the stalk; therefore in order to retain the

original sweetness and flavour it is necessary to can corn very soon after it is pulled—within an hour if possible. Select the ears with full grains before they have begun to harden, as this is the period of greatest sugar content. Husk them and brush the silks off with a stiff brush. Shear off the grains with a sharp knife and pack the jar full. Add salt to taste, usually about a teaspoonful to the quart is sufficient, and fill up the jar to the top with cold water. Put the rubber ring around the neck of the jar and place the glass top on loosely, as shown in fig. 7. Be careful not to press down the spring at the side of the jar.

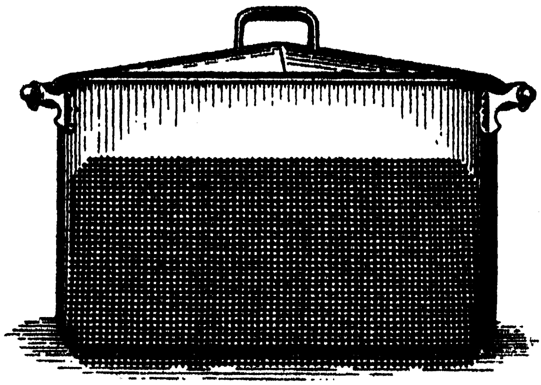

Fig. 5.—Sterilizer, showing the false bottom.

Place the false bottom in the boiler and put in as many jars as the boiler will conveniently hold. Don't try to crowd them in. Leave space between them. Pour in about 3 inches of cold water, or just enough to form steam and to prevent the boiler from going dry during the boiling. It is not necessary to have the water up to the neck of the jars, as the steam will do the cooking. Put the cover on the boiler and set it on the stove. Bring the water to a boil and keep it boiling for one hour. At the end of that time remove the cover of the boiler and allow the steam to escape. Press down the spring at the side of the jar, as shown in fig. 8. This clamps on the top and will prevent any outside air from entering. The jars can now be removed and cooled or allowed to stand in the boiler until the next day.

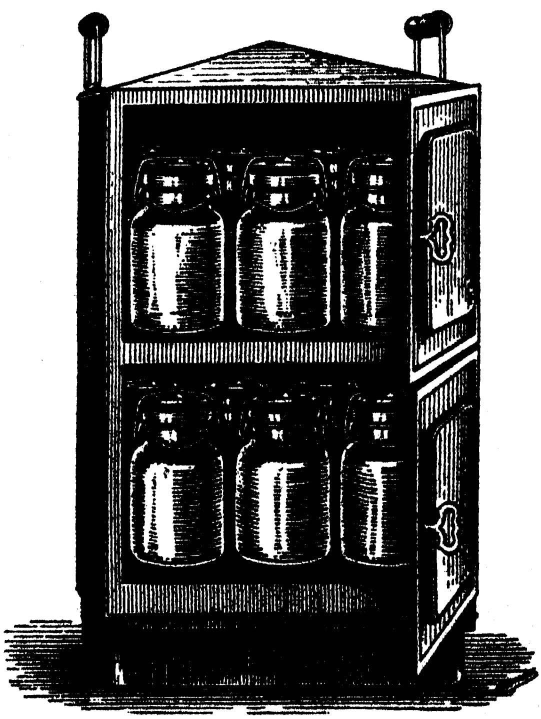

Fig. 6.—Steam Cooker.

On the second day raise the spring at the side of the jar, as shown in fig. 7. This will relieve any pressure from steam that might accumulate inside the jar during the second cooking. Place the jars again in the boiler and boil for one hour. Clamp on the top as on the preceding day and allow them to cool.

Repeat this operation on the third day. In removing the jars from the boiler be careful not to expose them to a draft of cold air while they are hot, as a sudden change in temperature is likely to crack them.

After the sterilization is complete the jars may be set aside for a day or two and then tested. This is done by releasing the spring at the side and picking up the jar by the top (fig. 9). If there has been the least bit of decomposition, or if sterilization has not been complete, the top will come off. This is because the pressure on the top has been relieved by the gas formed by the bacteria. In this case it is always best to empty out the corn and fill up the jar with a fresh supply. If canning fruits or some expensive vegetable, however, examine the contents of the jar and, if the decomposition has not gone far enough to injure the flavour, place it once more in the boiler and sterilize over again. If the top does not come off, you may feel sure that the vegetable is keeping.

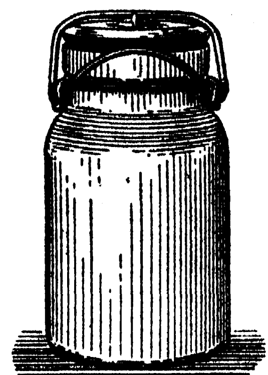

Fig. 7.—Position of spring during sterilizing.

STRING BEANS.

Select young and tender beans, string them, and break them into short lengths. Pack firmly in the jar, cover with cold water, and add a teaspoon of salt to each quart. Put on the rubber and top and boil for one hour on each of three successive days, as directed under "Corn." A small pod of red pepper placed in the bottom of the jar will give a delightful flavour to this vegetable.

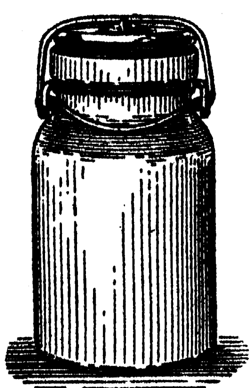

Fig. 8.—Position of spring after sterilizing.

BEETS.

Although beets will keep in the cellar over winter, it is very desirable to can them while they are young and tender, as the mature beet is apt to be stringy and lacking in flavour. Wash the young beets, cut off the tops, and put them in boiling water for about an hour and a half, or until they are thoroughly cooked. Take off the skins, cut in thin slices, and pack into the jars. Cover with water and sterilize in the manner previously described. If a mild pickle is desired make a mixture of equal parts of water and good vinegar, sweeten to taste, and cover the beets with this mixture instead of water.

SUMMER SQUASH.

Cut the vegetable into small blocks, pack in the jars, and cover with water. Add a teaspoon of salt to each quart and sterilize. It is sometimes preferable with this vegetable, however, to pare off the skin, boil or steam until thoroughly done, mash them, and then pack in the jars and sterilize. If canned in the latter way, it is advisable to steam them for an hour and a half, instead of for an hour, on each of three days, as the heat penetrates the jar very slowly. It is absolutely necessary that the interior of the jar should reach the temperature of boiling water. A jar will usually hold about twice as much of the cooked vegetable as it will of the uncooked.

English Peas.

When prepared and canned in the proper way, peas are easily kept and never lose the delicate flavour that they possess when fresh. Shell the young peas, pack in jars, and sterilize as directed under "Corn."

Fig. 9.—Manner of Test'ng.

Asparagus.

Can the young tips only, in the same way as you would corn.

Caulifower.

This vegetable usually keeps very well, but if the supply for the winter should begin to spoil, it may be necessary to can it during the summer. Prepare it as you would for the table, pack it into jars, and sterilize.

Carrots and Parsnips.

These, if gathered during the early summer and canned, make most excellent vegetables for the winter. The young plants at that season are not stringy, and have not yet developed the strong taste that is so objectionable to some people. Prepare as you would for the table, and sterilize.

Tomatoes.

Every housewife knows how to can tomatoes. They are very easily kept, even in the common screw-top Mason jar. If one already has on hand a number of jars of this pattern, it is best to use them for preserves or for canning tomatoes and to purchase the more modern styles for canning other vegetables. In using the Mason jars be careful to sterilize them first by placing in cold water, bringing to a boil, and boiling for about ten minutes. The rubber and top should also be immersed in boiling water for the same length of time. Remove them from the boiling water when needed, handling as little as possible. Be careful not to put the fingers on the inside of the top or the inner edge of the rubber. Fill the jar with the cooked tomatoes while steaming hot, put on the rubber, screw on the top firmly, invert it, and let it stand in that position until cool.

Kohl-Rabi.

This vegetable resembles the turnip in its habits of growth, although in flavour it more nearly approaches the cauliflower. It is grown in many sections of the North, but in the South it is almost unknown. Prepare it as you would turnips, pack in the jar, and sterilize.

Pumpkin or Winter Squash.

If provided with a warm, dry cellar, one may keep certain varieties of these vegetables all winter. Some of the best varieties, however, do not keep well, and even the best keepers when not properly housed begin to decay late in the season. It is then necessary to can them in order to save them. If one has a limited number of jars, it is a good plan to fill them all with other vegetables during the summer and upon the approach

of frost to gather the pumpkins and bring them indoors. By the time the pumpkins begin to spoil, enough jars will be emptied to hold them. They can now be steamed and canned in the same way as summer squash. In this way a supply of jars may be made to do double service.

Freshness of Flavour and Colour.

Vegetables when canned properly should retain their attractive colour and lose very little of their flavour. It will be found almost impossible to detect any difference either in taste or in appearance between the canned and the fresh article if these directions are carefully followed. The volatile oils which give flavour to most vegetables are not lost during this process of sterilization. Cooking for *three short periods* in a *closed* container at a comparatively low temperature instead of cooking for one short period at a high temperature or for *one long period* in an *open* vessel makes the vital difference and insures freshness of flavour and colour. After the jars have been sterilized and tested, they should be kept in the dark, as the sunlight will soon destroy the colour of the vegetable.

How to Open a Jar

Jars of vegetables are sometimes hard to open, unless it is done in just the right way. Run a thin knife blade under the rubber, next to the jar, and press against it firmly. This will usually let in enough air to release the pressure on the top. In case it does not, place the jar in a deep saucepan of cold water, bring to a boil, and keep it boiling for a few minutes. The jar will then open easily.

Cautions.

These directions for canning apply only to pint and quart jars. If half-gallon jars are used, always increase the time of boiling, making it an hour and a half instead of one hour.

Do not go into canning too deeply at first. Experiment with a few jars in the early part of the season and see if they keep well. It is not a difficult matter to can vegetables properly. The writer has never lost a can of string beans, okra, eggplant, carrots, parsnips, lima beans, beets, asparagus, or pumpkin in several years' experience, and has had only one can of peas spoilt, a few cans of corn during the earlier trials, and a few cans of succotash. Any housewife can do equally well. If you follow the directions here given carefully, you will have no difficulty whatever. If you should happen to fail in the first trial, rest assured that you have done something wrong or left something undone. No housewife who has on hand during the winter a supply of home-canned vegetables ready to serve on ten minutes' notice will ever regret the trouble or difficulties experienced in learning.

THE OSTRICH INDUSTRY.

THE POSSIBILITY OF IMPROVING THE STANDARD OF VELD-GROWN FEATHERS.

By STANLEY ELLEY, M.R.C.V.S.

Owing to the enormous increase which is almost daily taking place in the production of ostrich feathers, it is generally recognised that some steps should be taken to modify the supply, particularly of inferior types, for although it is probable that there will always be some demand for this class, it is equally certain that whatever steps are taken to improve the stock there will necessarily always be a considerable production of poor feathers. Taking it for granted that the somewhat heroic methods for the reduction of inferior quality birds recently advocated in the press will not find favour in the eyes of the ostrich farmers generally, it may not be out of place to consider the possibility of improving the standard of inferior troops. The majority of the poorer quality feathers come from the Midland and North-Western areas and from certain of the coastal districts. With regard to the latter, although some parts can, and, in fact, do, produce a very fair feather, there is no doubt that much of the coast belt is heavily handicapped in producing a good feather, both by the damp climate and the poverty of the soil. Throughout the Karoo, on the other hand, the climate is ideal for feather production, and the soil generally speaking good. There is no doubt that in these areas a great improvement can be made in the average of the feather produced.

The points of a feather from a purely commercial point of view, may be taken as under:—

Length	10
Breadth	13
Tip	8
Density of Flue	13
Regularity of Flue	10
Quill	7
Lustre	13
General appearance and absence of bars, discolouration, etc.	19
Weight (of Pluck)	7
	100

The average veld-grown feather, whilst falling short on most of the above points, will found to be lacking chiefly as regards breadth, tip, length, lustre, and general appearance, less in density and regularity, and still less as regards quill. In the writer's opinion the greatest of these defects could be the most easily rectified, and the method of doing so, could, in great part, be summed up in the words

"Selective Breeding."

In the Karoo areas above referred to, it has been the custom for many years to allow the birds to breed indiscriminately in large veld camps, and it usually happens with ostriches as with horses and other animals, that the least desirable, from a commercial point of view, are the most productive, hence the feathers, if anything, have been inclining to degenerate. There are two methods in which selective breeding may be carried out on this class of farm—I am referring to those farms on which there is no lucerne established—either by erecting camps on the best veld possible, of from twenty to twenty-five morgen, which should be sufficient for a pair of birds; or otherwise if, from the cost of fencing or any other reason it is not considered practicable to erect special breeding camps, castrate all birds, male and female, which it is undesirable to breed from, allowing only the selected birds to remain entire. The first method would be the most satisfactory.

Caponising.

I have been informed of isolated cases of capons showing some inclination to fight and interfere with the other birds, but this is quite exceptional, as the general rule they remain quiet and docile.

It may be here stated that it is not safe to castrate females which have once commenced to lay, so that the birds should be carefully looked through as soon as the sexes can be distinguished, that is when the first pluck after chick feathers is on, and all hens, at any rate, not showing sufficient quality to breed from should be marked for castration when the feathers are nipped. Although cocks of any age may be castrated, the risk is less and the operation much simpler if performed before the testes have fully developed. This usually takes place at about two years and six months, so that males should be castrated when cutting either the first or second pluck.

It is convenient to castrate at the same time as the feathers are nipped, as there is then no damage done to feathers, and the bird will have recovered from the effects of the operation before the quills are pulled.

On those farms upon which a few acres of lucerne have been established, it is upon the lucerne that breeding camps, each of about one acre, would probably be made; the chicks being turned into the veld when a few weeks old.

Selective Breeding.

As has been mentioned, the greatest defects, from a buyer's point of view, in the veld-grown feathers, are narrowness, lack of length, deficiency of tip, and general appearance, so that, speaking broadly, breeding birds giving a long, broad, nicely tipped feather and a bright showy bunch, should be selected.

Although perhaps desirable, it would not be absolutely necessary to buy birds themselves giving a prime feather, as this would entail an outlay of from £150 to £250 per pair. A good medium bird, provided the feather was broad, nicely tipped, and giving a good weight for the complete pluck, would go far to raise the standard of the average veld bird. Again, some of the Oudtshoorn farmers, particularly those who have no veld camps, occasionally find it necessary to cast a certain number of their birds, and many of these, although no longer giving a prime feather, are quite capable of producing good chicks.

I do not for a minute wish to be understood to imply that all the cast Oudtshoorn birds are fit to breed from, far from it; nevertheless certain of the farmers with limited ground are fortunate enough to be able to maintain all their stock up to a good standard, and it is from farms of this class that fair quality birds can sometimes be purchased at moderate figures. Or otherwise, first-class chicks can usually be purchased at from £5 to £10, and if but one pair of birds can be reared from every six chicks, the buyer would be very well repaid.

On those farms on which the mortality of chicks is but small, this would probably be the most economical method of starting a good stock.

A Warning.

It may not be out of place to offer a word of warning against paying long or even apparently moderate prices for birds without feathers, brought up-country and sold as "Oudtshoorn Primes," as it is becoming a common practice to buy any cast birds in Oudtshoorn and remove them either to the Midlands or to the coastal districts for sale.

It may be laid down as a general rule that no birds should be bought unless in plumage. Chicks likewise should only be bought after examination of the parent birds, as disappointment may result not from any attempt to sell an inferior chick, but as ideas regarding a good feather are so varied. It is quite possible that what the seller considers a very desirable feather, may not be at all up to the ideal of the buyer.

In view of the friendly rivalry occasionally to be noted in the press and elsewhere, between Oudtshoorn and the Eastern Province, the writer wishes to explain that he is not praising the Oudtshoorn feather to the exclusion of all others, having himself seen very good quality feathers in the east, but as the standard qualities of the former are indisputably, length, breadth and weight of the complete pluck, he considers it the better suited to improve the short narrow Karoo-veld bird. And here I would like to point out the necessity of breeding from good stock on both sides, as it frequently happens with ostrich breeding, as with horses and other animals, that too much store is set upon the male, whilst the points of the female are apt to be overlooked. Moreover, it not infrequently happens that birds which are themselves both good and apparently well mated, produce disappointing chicks, hence it is necessary to watch the chicks until the first pluck after spadonas is taken, and then if the feathers are not up to expectations, the parent birds can be changed. Excessive in-breeding should be carefully guarded against, as although the feathers may be improved in the first few generations, the constitution of the birds must suffer. This evil has undoubtedly been somewhat overlooked in the past.

Lucerne and Feathers.

It is sometimes argued that the lucerne feeding is responsible for the great length and breadth of the Oudtshoorn feather, and also for its occasional tendency to run woolly; and conversely that the Karoo veld will always produce a harsh narrow flue. Whilst admitting the possibility of constant lucerne feeding tending to increase the woolliness of a feather *already naturally inclined* to be soft and woolly, it would be ridiculous to attribute all the qualities of the Oudtshoorn feather to lucerne, as if this were the case the selective breeding which has been carried out for about thirty years might have been dispensed with, and instead of paying five to ten pounds for good chicks as is being done at present, chicks from up-country might be bought for as many shillings and placed on the lucerne; in fact this experiment was tried, but the results were not encouraging.

Moreover, there are many birds in the Oudtshoorn District whose ancestors for some generations back have fed on lucerne, producing a feather with as hard a flue as any veld bird. Also it is a common occurrence to find two birds on the same farm, living under precisely the same conditions, the one producing a soft woolly flue and the other a hard firm feather, so that it is very evident it is chiefly the "blood" or breed which influences the character of the feather.

The Oudtshoorn Feather.

To anyone who has attempted to study the system adopted when selective breeding of ostriches first commenced, it is quite evident where the qualities of the Oudtshoorn feather come from.

The first point aimed at for many years was to produce birds giving a big showy bunch of long, broad feathers, and everything was sacrificed to this end. Or rather nothing else was thought of until in quite recent years, when the quality of the flue came to be considered. There is no doubt that this effort to produce a big, showy bunch of large feathers has led to the great breadth often attained by the Oudtshoorn birds, and also for the ragged woolly appearance occasionally met with. In fact extreme length of flue, *i.e.*, breadth of feather, serves rather as an example of the evil which may result from too persistently breeding with but one aim in view, and is a point to be guarded against, as a flue measuring eighteen inches across, which is not unknown, cannot be expected to have the quality and strength of one measuring twelve.

Lucerne v. Selective Breeding.

Granted then that it is not the lucerne, but selective breeding which is mainly responsible for the qualities of the Oudtshoorn feather, it may be safely argued that it is not the Karoo veld alone which is responsible for the short, narrow feather produced on it. In point of fact the writer has in his possession feathers from some dozen birds taken from various parts of the Karoo, birds who themselves and whose progenitors never saw lucerne, and many of these have a flue though short, still as soft as most lucerne fed birds, and undoubtedly veld which can produce some of these feathers, can also produce something very much better, if only good stock is bred from. However,, if a good quality feather is to be grown on the veld, not only must good stock alone be bred from, but any approach to over-stocking must be strictly guarded against. This evil of over-stocking acts both directly and indirectly towards the production of a poor pluck, directly by maintaining the birds in poor condition,—probably at the very time when the feather production demands an abundance of nourishment, that is for the first two or three months after quilling; and indirectly by necessitating the feathers being left longer on the birds than would be necessary if food were abundant throughout the feather growth. It is this extra month or two during which the feathers are left on to ripen, which does so much to spoil the lustre and general appearance of the feather; for it is probable that in the areas above mentioned, if the birds were always maintained in good condition the feathers could be nipped at six or seven months after quilling, instead of having to leave them eight or nine months as is often done at present.

In conclusion, if by judicious breeding from selected birds, the average price per pluck, per bird, can be doubled, surely it would be more satisfactory to maintain half the number of birds formerly kept since the loss from drought would be reduced to a minimum, and there is no reason to suppose that what selective breeding has done for birds kept on lucerne will not apply equally to those kept on the veld.

AGRICULTURAL ZOOLOGY FOR SOUTH AFRICAN STUDENTS.

BEING A COURSE OF LECTURES ON AGRICULTURAL ZOOLOGY, DELIVERED BY DR. J. D. F. GILCHRIST, PROFESSOR OF ZOOLOGY AT THE SOUTH AFRICAN COLLEGE, IN CONNECTION WITH THE TECHNICAL EVENING CLASSES INAUGURATED BY THE SCHOOL BOARD OF THE CAPE DIVISION.

(*Continued from page 176*).

COELENTERATA, OR SEA-ANEMONES, JELLYFISH, ETC.

The Coelenterata are *simple sac-like organisms*, which may be conceived as arising from a hollow sphere of cells like the protozoan Volvox, by the pushing in of one side or the growing over of the other so as to form a double layered cup or sac; or a number of cells in a protozoan colony may be imagined as specializing into digestive cells and becoming internal, the most suitable place for such cells, the other specializing as protective cells or cells for the procuring of food and remaining external. This is obviously the simplest possible division of labour or co-operation and may have been the first in point of time. At any rate from this group upwards we find *two layers of cells*, *ectoderm* and *endoderm*, or outer and inner layer. Such a distinction, however, is not to be pressed too far and the terms, though helpful, may be misleading as zoological and other names often are.

In the higher forms a third layer of cells (the mesoderm) appears between these, but in the Coelenterata there are no cells or only a few scattered ones in this region which is occupied by a *structureless gelatinous layer* in the form of a thin sheet or a thick jelly-like mass. This middle layer has received the name *mesogloea* to distinguish it from the mesoderm, which is a definite layer of cells in the higher forms. The name is distinctive and useful though the student must bear in mind that there is no such structure as an endogloea or ectogloea.

In another respect this group differs from higher groups, namely that there is *no cavity or coelom* between ectoderm and endoderm. This appears in the higher forms as a definite cavity lined by cells and having to do chiefly with the organs of reproduction and excretion. Here the *generative cells arise either from ectoderm or endoderm.*

Another characteristic of the group is their *radial symmetry*. They are not animals that crawl about actively in search of food, but are as it were mere fixed or floating stomachs waiting to receive what may come within their reach. Consequently they have neither an anterior and posterior end, nor a right and left side, but are in their simplest form radially, not bilaterally arranged.

Though themselves incapable of moving about much, some sea-anemones have acquired the habit of fastening on to animals more highly endowed in this respect. Fig. 19 represents an interesting illustration of this. A shell, whose lawful tenant had been a mollusc, has been appropriated by a hermit-crab, which occupies the interior while a number of anemones have fastened on to the exterior. The crab furnishes the locomotory power

and the anemones the means of defence as most sea animals dread their stinging cells.

When we come, however, to examine these organisms in more detail it will be found that the cells of which they are composed are much more highly specialized than would appear from a superficial examination, for instance there are usually *nematocysts or stinging cells* developed in the ectoderm and endoderm.

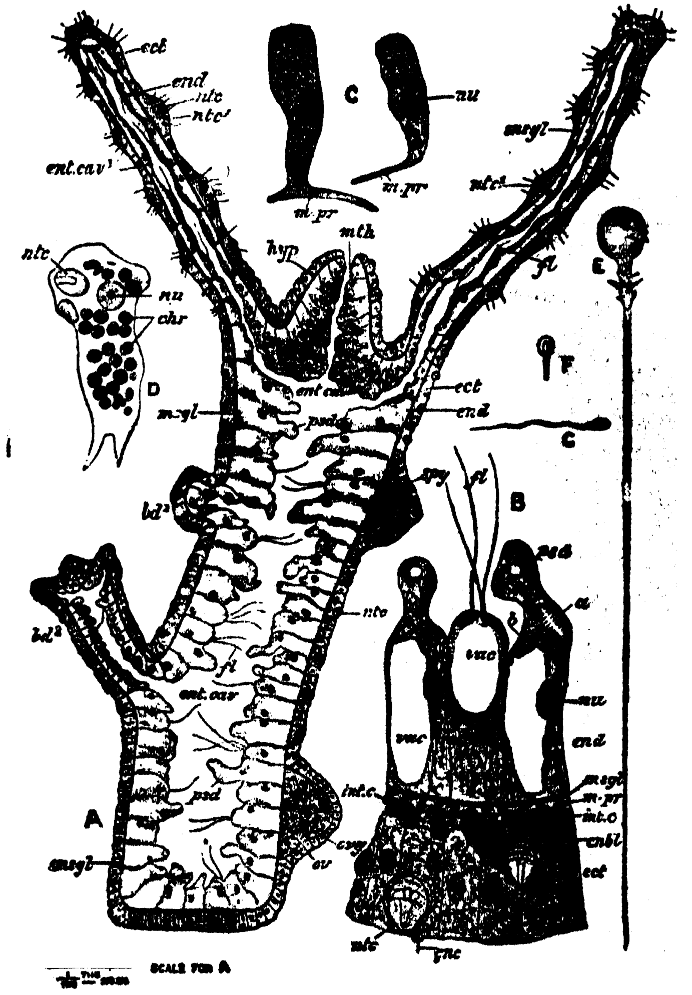

Fig. 16.—Hydra. A, vertical section of entire animal; B, portion of transverse section, highly magnified; C, two large ectoderm cells; D, endoderm cell of *H. viridis*; E, large nematocyst; F, small nematocyst; G, sperm; *a*, ingested diatom; *bd*[1], *bd*[2], buds; *chr*. chromatophores; *cnbl*, cnidoblast; *cnc*, cnidocil; *ect*, ectoderm; *end*, endoderm; *ent. cav*, enteric cavity; *ent, cav*[1], its prolongation into the tentacles; *fl*, flagellum; *hyp*, hypostome or manubrium; *int. c*, interstitial cells; *m. pr*, muscle processes; *mth*, mouth; *msgl*, mesogloea; *ntc*, large, and *ntc*[1], small, nematocysts; *nu*, nucleus; *ov*, ovum; *ovy*, ovary; *psd*, pseudopods; *spy*, spermary; *vac*, vacuole (After Parker and Haswell).

Hydra (Fig. 16) may be taken as a type of the Coelenterata. It is a small animal (2-6 mm. in length) common in pools of standing or slowly running fresh water, attached to sub-merged plants, sticks, etc. If some of this vegetable matter be placed in a glass jar of water and left exposed to the light the animals may be found on the lighted side of the jar, or

if left in a white basin, they will attach themselves to its sides. They are fairly common in South African vleis and ponds. They can readily be kept in captivity and their habits studied. It will be observed that, though made up of many cells, the whole organism acts as one. It shrinks away on irritation; it moves towards the light; it responds immediately to the contact of food by shooting out its stinging cells. Its tentacles, 5 to 8 in number, sway about slowly in search of food which they transfer to the mouth which is on a conical projection (hypostome) in the centre of the tentacles. The whole animal can progress by a looping movement like some caterpillars. Compare the simpler organs of the Protozoa and note that the individual cells of this Metazoan or colony of cells acts so concertedly or in such unison, that the whole may be regarded as an individual as truly as the simpler single-celled Amoeba.

Fig. 17.—*Physalia*, the Portuguese Man-of-war. (After Agassiz.)

When examined more minutely by means of fine sections it is seen that the body and tentacles are composed of two layers of cells, with a thin non-cellular layer between them. These are the ectoderm, endoderm and mesogloea.

The *ectoderm* consists of large cells, narrower at their bases, around which a number of smaller or *interstitial* cells occur. The inner ends of the large cells are prolonged into *muscular processes*. Compare the axial fibre of Vorticella and note that as yet there are no cells specialized wholly as muscle cells. Between the large cells there are, however, others which show a surprising degree of specialization. Each has in its interior a little sac or cyst (nematocyst) which is drawn out into a long fine hollow thread. This usually lies coiled up in the cell surrounded by a fluid. A fine pointed process (the *cnidocil*) projects at the free end of the cell containing the nematocyst, and if this be touched the cell (cnidoblast) contracts and the long thread is shot out with the surrounding fluid (compare the trichocysts of Paramoecium). The thread is not simply thrown out, but is everted or turned inside out. The effect on any small animals, such as water fleas, which may accidentally stumble across such a mine, is instantaneous; they are suddenly paralysed and may become fixed to the tentacle by little spines which occur round the base of the thread; they are then carried towards the mouth from which they pass into the stomach of the Hydra. These thread cells occur in little heaps, especially on the tentacles. Should experimental proof be required of the power of such stinging cells, it is only necessary to handle one of the bright blue tentacles of an allied form, the "Portuguese Man-of-war" (Fig. 17) so common in the South African seas. Mere contact with these produces severe irritation of the skin, and cases of serious results to bathers are not unknown.

The *endoderm* cells which line the hollow body and tentacles are of a more primitive character, being possessed of pseudopodia or flagella. They may take in food into their substance like Amoeba (intra-cellular digestion),

or they may give out a fluid which digests the food (extra-cellular digestion) as in higher animals. In addition to the usual nucleus they have large spaces or vacuoles.

Reproduction may be by mere *budding* from the side of the body. These buds gradually assume the character of the adult and drop off. It may also be by means of eggs and sperms. Little heaps of interstitial cells become converted into sperms or small cells with a nucleus and a long vibratile tail by means of which they can swim about freely on the rupture of the covering cells. These little heaps are obviously *testes* or male gonads. Nearer the attached end of the animal other groups of interstitial cells may be formed, but here, instead of dividing up into a number of individual cells, one of them begins to grow at the expense of the others, so that finally there is only one large cell left, covered by a layer of superficial cells. The contents of this capsule are to be regarded as an *ovary* which, however, contains only one ovum or egg. When the capsule bursts a free swimming sperm may enter and conjugate with the ovum; that is, two gametes form a zygote, as we have seen in the Protozoa; or, in other words, a sperm and ovum may fuse together to form an oosperm. This oosperm then begins to divide or segment, and these segments do not separate but cohere in a round ball or morula. The outer cells of this become a hard capsule, inside which the remaining cells, after a period of rest, gradually become differentiated into ectoderm and endoderm. Mouth, tentacles and digestive cavity appear, and we have again an adult Hydra.

Coelenterata may be classified according to the complexity of their digestive cavity. In some the mouth region is folded in so as to form a gullet which is thus of ectodermal origin, and the simple saccular stomach may have its walls complicated by ridges, partitions or radiating septa (mesenteries) of various kinds. Such forms (ACTINOZOA) are more specialized than Hydra and its allies (HYDROZOA). Another group (CTENOPHORA) is characterized by the more specialized condition of the middle layer, by the possession of special sense organs and other features which mark it off from the two other groups.

Class I.—Hydrozoa.

This class is typified by Hydra, which has a simple digestive tract without either mesenteries or ectodermal gullet and with no free swimming forms. Such hydra-like forms are included in the order HYDRIDA. Others in the class differ from these in having free swimming forms and are placed in the order HYDROMEDUSAE. Bougainvillia may be described as a type illustrating this second order.

BOUGAINVILLIA (Fig. 18) is a form closely resembling Hydra, but differs from it in that (1) the buds may not be set free, so that the whole grows into a tree-like structure which is strengthened by the secretion of a thin *cuticle*. At the ends of the branches are hydra-like bodies or *hydranths*, each with its circle of tentacles, and a mouth at the apex of a little conical projection or hypostome; (2) some of the hydranths may become globular and then bell-shaped with a central projection, the *manubrium*, at the end of which is the mouth. The large bell is of a gelatinous material covered by ectoderm. The digestive tract is lined by endoderm as in Hydra, but it is more complex. At its basal or attached end it is branched out into *four radial canals*, which open into a *circular canal* at the edge of the bell. The canals are also connected together by a thin sheet of endoderm (the *endoderm lamella*). At the end of each radial canal is given off, at the edge of the bell, a pair of *tentacles* which have a little eye spot, *ocellus*, or speck of pigment at their bases. The margin of the bell is also turned in

to form a sort of ledge or *velum*. It is obvious that this organism is merely a modified hydranth, and we have here a case of *dimorphism* or individuals of two forms in the same species of animal. When mature this *medusa* or jelly-fish as it is now called becomes free and swims or is carried by currents a long way from the parent stock. The significance of this is apparent when we learn further that it is only these free forms that produce ova and spermatozoa, so that eggs and embryos may be distributed over a very wide area. The gonads occur in the manubrium between the ectoderm and endoderm. The same individual does not produce both sexual elements as in Hydra, *i.e.*, they are not hermaphrodite or monoecious but are dioecious or with separate sexes.

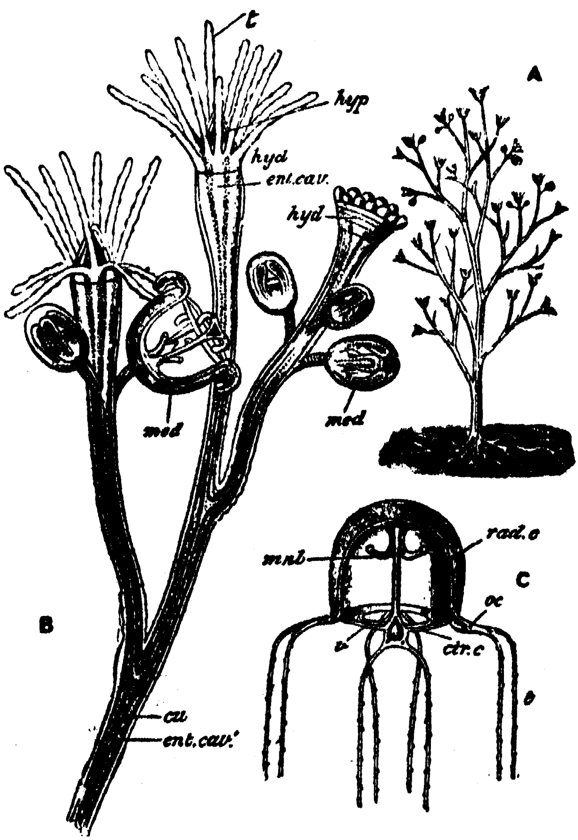

Fig. 18.—*Bougainvillia ramosa*. *A*, entire colony, natural size; *B*, portion of the same magnified; *C*, immature medusa; *cir. c*, circular canal; *cu*, cuticle or perisarc; *ent. cav*, enteric cavity; *hyd*, polyp or hydranth; *hyp*, hypostome or manubrium; *med*, medusa; *mnb*, manubrium; *rad. c*, radial canal; *t*, tentacle; *v*, vellum (From Parker's "Biology," after Allman).

The egg, when fertilized, divides up as before into a round mass of cells or morula, the outer cells of which become differentiated and provided with cilia. In the inner or endoderm cells a cavity appears, the enteron or digestive cavity. The embryo has meanwhile become elongated, and it can swim about freely by means of its cilia, being known now as a *planula*. Finally, however, it settles down becoming attached by one end; mouth, tentacles, etc., appear, and it grows and buds extensively till the adult branching form is again assumed.

Besides dimorphism this type illustrates clearly what is meant by *alternation of generation* or metagenesis, in which an asexual generation (here the branching form) gives rise by budding to a sexual generation (here the medusa) which in its turn produces, by the sexual process (eggs and sperms), an asexual generation.

The South African student can readily obtain forms similar to Bougainvillia. They grow on rocks in pools and look like very fine sea weed. OBELIA is a form producing free medusae. TUBULARIA is an allied form in which degenerate medusae are produced.

Fig. 19.—SEA-ANEMONES: four individuals attached to a mollusc's shell, inhabited by a hermit crab, *ac*, *ac*, acontia; *sh*. shell of gastropod. (Osborn, after Andres).

Class II.—Actinozoa.

In this class the digestive cavity is provided with mesenteries and an ectodermal gullet is present. In the simpler forms, of the order ALCYONARIA as illustrated by the red branching coral-like "Zee Tak" (Gorgonia flammea) so often cast up on the shores of South Africa, there are eight fringed tentacles. In the sea-anemones (Actinia, etc.), which belong to the order ZOANTHARIA there are many conical tentacles in six or multiples of six with mesenteries in pairs. In the large jelly-fish such as Aurelia the medusa-stage is the prominent one and the polype-stage, when present as in Aurelia, is reduced. These are placed in the order

ACALEPHAE. A brief description of a sea-anemone such as Actinia will illustrate the class.

ACTINIA (Figs. 19 and 20) or other genus of the sea-anemones is a type which shows a distinct advance on the previous two types. Various genera and species of sea-anemones are common on the sea shore, and may readily be studied in the living condition. The body is a thick cylinder firmly attached by one end; the other being free and with a circle of numerous tentacles surrounding a slit-like mouth. If the tentacles be touched they will adhere to the finger and attempt to draw it towards the mouth, but will do no serious injury though the animals are popularly known as "blood-suckers." If irritated many of them will shoot out long white threads from apertures in the side of the body. These threads are well provided with stinging cells. Occasionally a whitish pharynx or *gullet* may be seen protruding from the mouth. This is merely a folding in of

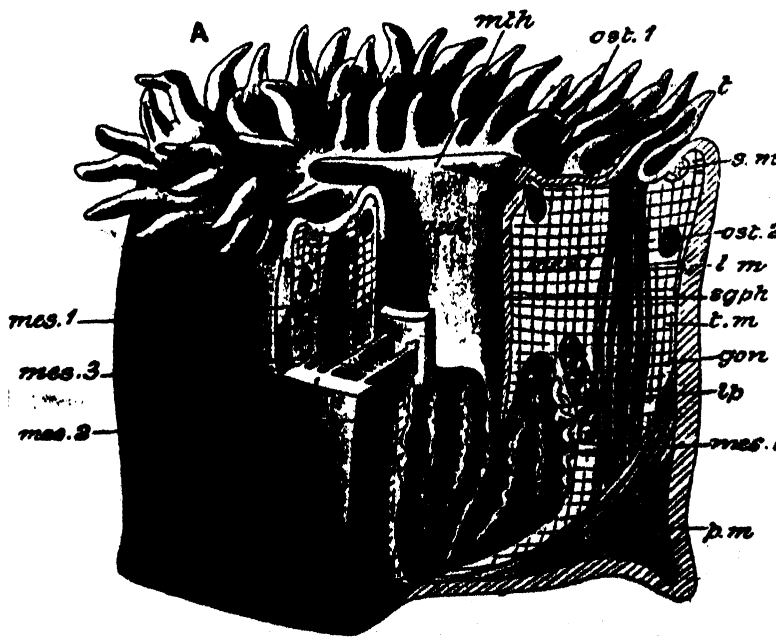

Fig. 20.—A Sea Anemone, partly dissected to show: *gon*, gonads; *gul*, gullet; *l. m*, longitudinal muscle; *l. p*, lappet or prolongation of gullet; *mes. 1*, primary; *mes. 2*, secondary; *mes. 3*, tertiary mesenteries; *mes. f*, mesenteric filaments; *mth*, mouth; *ost. 1*, *ost. 2*, ostia; *p. m*, parietal muscle; *sgph*, siphonoglyphe; *s. m*, sphincter muscle; *t. m*, transverse muscle (From Parker).

the ectoderm or skin but marks a distinct advance on the previous two types. The gullet is connected internally to the sides of the body by a number of radiating partitions or mesenteries which project from all sides of the body in towards the centre, so that the digestive cavity has a number of chambers round it. The free edges of these partitions, below the gullet, show peculiar twisted cord-like structures, the *mesenteric filaments*, which may be digestive organs, and the thread-like *acontia* which are shot out through apertures in the body wall or *cinclides* as above noted. The body wall, gullet and partitions, all consist of ectoderm, endoderm and mesogloea, as in the other types. The mesenteries communicate with each other by apertures or *ostia*; they have also well developed *muscle-bands*, and it is specially to be noted that on their walls the *gonads*—ovaries and testes—are developed, so that, if the cavities were shut off from the central

stomach, which they surround, we would have an arrangement resembling the digestive tract and coelom or body cavity of higher animals which arises as outgrowths from the digestive tract. In the higher animals there are also excretory cells and ducts connected with this cavity but no such definite excretory organs are developed here.

In Actinia there is no medusa-form as in Bougainvillia, but in the group to which it belongs there are forms like the larger jelly-fish, such as Aurelia (Fig. 21) in which the medusa-stage is well developed and the hydra-like or polype-stage is much reduced though it still resembles Actinia rather than Hydra there being a gullet and gastric ridges. It may grow by budding laterally, but gives rise to young medusae, by a peculiar process of transverse division, (strobilation). These young *medusae*, at first with large radiating arms, develop into the adult form which is rounded and with many marginal tentacles.

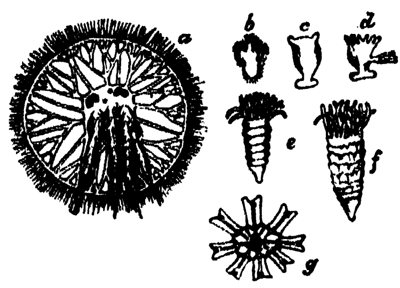

Fig. 21.—*Aurelia*. *a*, Adult much reduced, showing marginal tentacles, and four oval arms ; *b-g*, stages in development.

Class III.—Ctenophora.

This third class forms a connecting link to forms higher than the Coelenterata as it has a well developed middle layer. It differs much from the other classes; thus, there are seldom stinging cells; there is a large ectodermal gullet but the stomach is reduced to branching tubes; a peculiar *sense organ* is placed at the end of the animal opposite the mouth; they swim by means of eight longitudinal bands of *ciliated plates*. It has been suggested that they form a connecting link between the Coelenterata and the Flat-worms.

The Ctenophora may be readily procured in the sea by means of fine muslin nets towed behind a boat. They are usually clear spherical globes along the sides of which the iridescent flickering bands may be seen in constant motion. HORMIPHORA and BEROE are common forms.

Classification of the Coelenterata.

Class I. Hydrozoa.

Order I. Hydrida, *e.g.* Hydra.
,, II. Hydromedusae, *e.g.*, Bougainvillia, Obelia, Tubularia.

Class II. Actinozoa.

Order I. Alcyonaria, *e.g.*, Gorgonia flammea.
,, II. Zoantharia, *e.g.*, Actinia.
,, III. Acalephae, *e.g.*, Aurelia.

Class III. Ctenophora, *e.g.*, Hormiphora, Beroe.

PORIFERA OR SPONGES.

The Sponges present a great variety of forms. They may be round masses like the ordinary bath sponge, or flat like a form easily found on the sea-shore covering the rocks with a felt like growth; other forms are branched or cup-shaped. They look more like plants or vegetable growth than animals. They occur abundantly in the sea though a few are found

in fresh water. A South African fresh water form can be found growing on the reeds and substances in pools and presents the appearance of a fungus or some encrusting form of vegetable life (EPHYDATIA FLUVIATILIS VAR. CAPENSIS, Fig. 22.)

It is not easy to connect the sponges on to any other group of animals. They consist of cells arranged in two layers which do not, however, arise from the embryo in the same way as in the Coelenterata and other animals, and it has been suggested that the sponges may have arisen from Protozoan

Fig. 22.—*Ephydatia fluviatilis var. capensis*, a South African fresh water sponge, showing winter form (on left) and summer form (on right). Both growing on stem of a water plant.

ancestors as an independent and distinct stock, which, however, does not progress further. The reason of this is perhaps to be looked for in the mode of life of the sponges. We have seen in the Protozoa that an easy mode of life tends to degeneration or the arrest of progress. The particular mode of life adopted by the sponges is one which, even in the higher animals, as we shall see, leads to very great degeneration. It is very simple; certain flagellate cells specialize as current producers, thus bringing the food to the animal which has therefore no need of special tentacles, nematocysts, or other organs for the capture of prey as in the Coelenterata, much less to go about actively in search of food as in higher groups. A change of locality is doubtless desirable, but this the sponge effects in some species by growing on the backs of crabs. The sponges not only have an easy method of procuring food, but also a simple method of protection or defence. They have *no stinging cells* but sharp needle-like spicules of carbonate of lime or silica are usually secreted by the *greatly developed middle* layer. The possible result in modification of the structure of the adult as well as the development of the young as a result of these features should not be lost sight of.

A simple sponge (Fig. 23) is superficially not unlike a coelenterate. It is sac-like with one large opening and many small pores in its sides. The water is drawn in by these small pores or *inhalent apertures* (hence the name Porifera) and passes out by the large opening or *osculum*, which looks like the mouth of a sea-anemone but is of an entirely different origin. The wall of the body is made up of two layers, an outer or *ectoderm* and an inner or *endoderm*, though these do not correspond to the similarly named layers in Hydra. The interior or gastric cavity is lined largely by the *flagellate collar cells*, so called as they are provided with peculiar collar like projections round the base of the flagellum, recalling similar cells which occur in some forms of Protozoa from which sponges may therefore be independently derived. Currents are set up by the lashing of the flagella, and the collar-like projection seems to have to do with the capture of passing food particles. The middle layer is well developed, and in as much as it consists of a variety of cells not only amoeboid but generative cells (ova and spermatozoa), spicule-forming cells and perhaps muscle cells, it may be considered as an approach to the mesoderm of higher forms. Wandering cells may acts as food or excreta carriers. Spicules of various shapes and sizes and the softer flexible horny substance, spongin, are formed here more or less extensively. Most sponges are not simple individuals like the Anemone, but consist of branching gastric cavities or tubes, similar to those we found in Bougainvillia. These become so fused together and involved that it is impossible to speak of individuals in sponges, except perhaps we look upon each osculum as representing one.

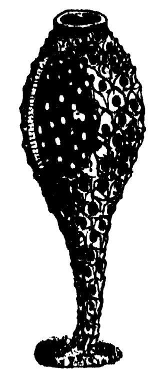

Fig. 23.—*Ascetta*, a simple sponge, showing large aperture (o-culum) and small aperture (inhalent pores) at the side, part of which is removed to show interior (after Haeckel).

In the *development* of the sponge a larval form like the planula of Coelenterates arise from the egg, provided externally with a layer of ciliated cells. These external cells are not, however, destined to form an ectoderm as in the Coelenterates, but, by a disruptive process, they come to lie internally, and finally form the cells lining the gastric cavities of the adult, so that we cannot compare the ectoderm and endoderm of the adult sponge with those of a Sea-anemone or any Coelenterate. The layers are here practically reversed.

Sponges have another method of reproduction, well illustrated in the South African fresh water sponge. This sponge apparently dies off in the dry summer season and in place of the large felt like mass attached to the reeds, grasses, etc., only the remains of this are to be seen with a number of little hard capsules which on the return of winter and moisture again grow into a sponge. The two forms are shown in Fig. 23.

Sponges have been classified, on the basis of the nature of their skeletal parts, into Class I. Calcarea or sponges with calcareous skeleton and Class II. Non-calcarea or sponges with siliceous or horny skeleton.

PLATYHELMINTHES OR FLAT-WORMS.

This group may be thought of as representing the first successful attempt to move or crawl along the surface of the ground in search of food or to escape enemies. Sea-anemones and jelly-fish are fixed or float about and do not crawl or swim actively in search of their prey, and they retain their circular or radiate symmetry; in this new group, however, the animals

move about with mouth directed to the ground or substratum and there is a right and left side to the body, which is therefore *bilaterally symmetrical* and more or less *flattened* and elongate with the beginnings of a head and brain. There is an ectoderm and endoderm and between them a somewhat elaborate system of tissues consisting of excretory tubes, genital organs and ducts along with muscular and connective tissues. These may be looked on as constituting a *more definite mesoderm* than we have yet met with. There is, however, *no definite body cavity or coelom*. Their digestive system (absent in some parasitic forms), sometimes elaborately branched, is still of the blind saccular type, there being *no anus*. The absence of a body cavity and anus might well be regarded as the results of degeneration, but there is not sufficient evidence as yet for this supposition. The excretory tubes which are elaborate, and said to pass *through* the cells, end in the body blindly in a single cell which is provided with a characteristic flame-like cilium which probably helps in excretion. Such cells are known as *flame-cells*. Perhaps to be associated with the presence of an elaborate excretory system in the *absence of a vascular or blood system*. The reproductive organs are complex and part of the ovaries is specialized as a characteristic *yolk gland* which furnished nourishment for the developing embryos.

Distomum Hepaticum, the Liver-Fluke (Fig. 24) may be taken as a type to illustrate the group. The adult is found in the liver and bile ducts of the sheep. It may also occur in cattle and other domestic animals and even in man.

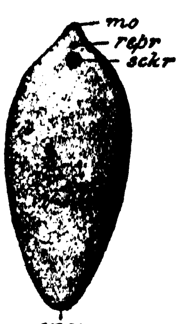

Fig. 24.—*Distomum hepaticum*, natural size. *excr*, excretory pore; *mo*, mouth; *repr*, genital aperture; *sckr*, posterior sucker.

It is of the general shape of a leaf or a Fluke (a small flat-fish) from which it derives its popular name, and is of a pale straw colour. It causes the serious disease "liver-rot" which is found to be more prevalent in certain localities and at certain seasons, viz.:—near fresh water vleis and damp marshy places which may be flooded in the rainy reason. The reasons for this will be apparent from its life history.

The body is flat and oval, soft in texture, and about an inch or an inch and a half in length and half an inch in breadth. Anteriorly there is a projection on which is situated the mouth in the centre of a sucker (*anterior sucker*). At the base of the projection and in the middle line is the posterior or *ventral sucker*, an independent organ not connected with any opening. The *genital aperture* lies between the two suckers rather nearer the posterior and from this a muscular process, the penis or cirrus, may protrude. The *excretory pore* is a small opening at the posterior end of the body. The body is covered by a thin *cuticle* which is produced into spines directed backwards. There is no cellular epidermis below this, but layers of circular and longitudinal muscles. The intestine may be seen shining through as two dark streaks.

The mouth is followed by a thick muscular pharynx which leads to a forked intestine, the two branches of which give off numerous blind smaller branches penetrating throughout the body.

The excretory system consists of a network of minute vessels ending in flame-cells. These vessels join together into larger and then into one large vessel, which opens to the exterior at a pore on the posterior end of the animal.

The nervous system is well developed consisting of a ring of nervous tissue surrounding the oesophagus, with ganglia or thickenings composed of groups of nerve cells. There is one of these on each side and one below

Nerves are given off from this ring, chiefly two, one on each side, with numerous branches (Fig. 25).

The reproductive system is complex, the animal being hermaphrodite. The *testes* consist of two much branched tubes, the one in front of the other. They lead by two tubes (vasa deferentia) to a median sac (vesicula seminalis) and from thence to the penis. The *ovary* is a branched tube lying on the right side in front of the testes. The branches lead into a common narrow tube, the oviduct, which expands into a wide convoluted tube called the uterus opening at the common genital aperture. In connection with the female organs there are numerous *yolk glands* scattered along each side of the body leading by ducts into the oviduct and supplying the eggs with nourishment for the future embryo. There is also a *shell gland* at the point of junction of the oviduct and uterus to form the shell into which each ovum with its supply of yolk is packed on fertilization. The egg while developing remains for a time in the uterus. The manner of fertilization is peculiar; the spermatozoa apparently entering by a pore on the dorsal surface of the animal and being conducted by a fine canal, the vagina or *canal of Laurer*, to the oviduct.

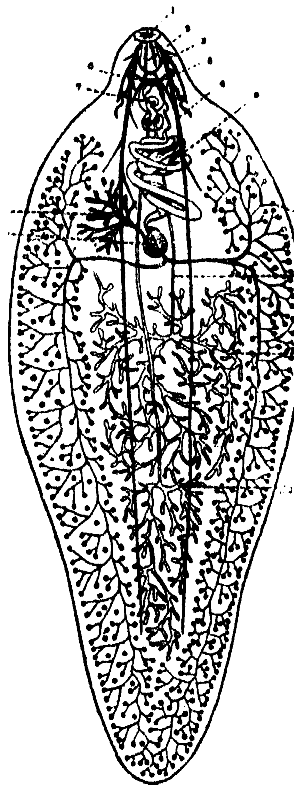

Fig. 25.—Diagram of reproductive and nervous system of *Distomum hepaticum* × about 8. 1, Mouth; 2, Pharynx; 3, Nerve-ring; 4. Chief longitudinal nerve; 5, Beginning of alimentary canal; 6, Opening of penis; 7, Vesicula seminalis; 8, Uterus; 9, Ovary; 10, Shell-gland; 11, Anterior testis; 12, Posterior testis; 13, Yolk-glands; 14, Vas deferens (Shipley, from Leuckart).

Life-history of the Liver-Fluke.

The eggs are produced in large numbers. Each is a small oval body encased in a dark chitinous shell. The eggs when laid escape into the bile ducts and from thence into the intestine of the sheep, where they are carried with the excreta to the exterior and thus distributed in vast numbers all over the ground. They die unless they reach moisture, so that dry ground or a dry season is not favourable to the development of the disease in sheep. They may, however, fall on marshy or damp ground or be carried by rain into streams or vleis and there they incubate further, the development of the embryos taking from two weeks to three months according to the temperature.

Should conditions be favourable the embryo hatches out and escape from the egg by the rupture of a little lid at its end. The embryo (or *Miracidium*, Fig. 26a) thus set free is a lively little animal of a conical shape, with a small head or projection at its anterior end, a little way behind which is an X-shaped eye spot with a ganglion below it. The ectoderm is a single layer of flattened cells and is covered with cilia by means of which the animal can swim about actively in the water. It has a sucker, a mouth, and intestine though not well developed. Between

intestine and body wall are a number of germ cells and there is a poorly developed excretory system consisting of two flame-cells and ducts. The eggs doubtless perish in great numbers by drying up but another and equally serious risk has to be taken by the embryo, for, unless it meets with a particular water snail within about twenty-four hours, it dies. This snail is Limnaeus truncatulus in Europe; probably L. humilis in N. America and L. viator in S. America. Should it be fortunate enough to meet with this snail it bores its way into it by means of its head-like projection and becomes lodged in the tissue at the respiratory opening. Once safely lodged there, it begins to be transformed into a spore sac or *Sporocyst*. It loses its eye-spot and ganglion and becomes a mere bag of germ cells, each of which behaves like a developing egg; the Sporocyst may be looked on as a very degenerate fluke everything being sacrificed for the reproductive cells. These cells develop without the process of fertilization, *i.e.*, parthenogenetically, into forms which reach a higher

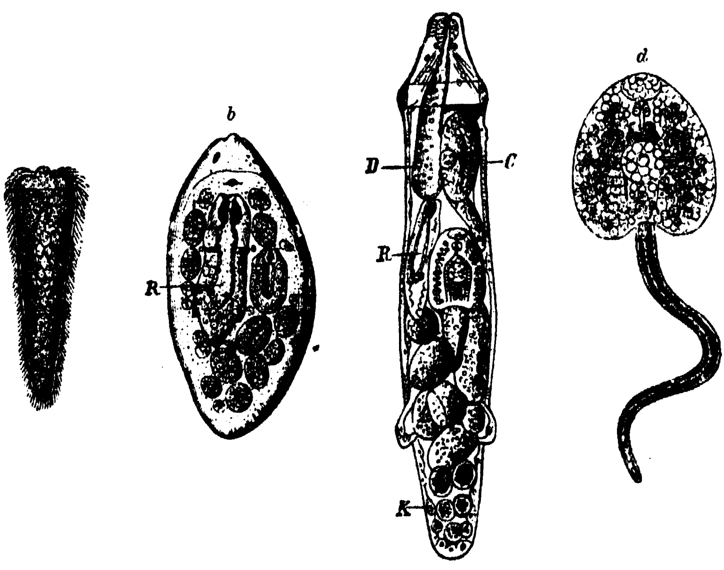

Fig. 26.—Stages in the life-history of *Distomum hepaticum*. *a*, Miracidium (ciliated embryo); *b*, Sporocyst with rediae *R*; *c*, redia (after Thomas); *D*, gut; *C*, Cercaria; *R*, redia; *K*, germ-cells; *d*, Cercaria (Sedgwick after Leuckart and Thomas).

stage than their mother the Sporocyst. Each eventually becomes a *Redia* after passing through a morula and gastrula or sac-like stage. The Rediae have an anterior sucker, a pharynx, a simple intestine, and two blunt projections near the posterior end by means of which they move about. After escape from the Sporocyst they wander about in the respiratory cavity of the snail and then penetrate to the liver on which they feed. Meanwhile, other Rediae have developed parthenogenetically from germ cells within them. The second generation again reproduces parthenogenetically, so that great numbers of these small parasites are produced. The last generation of Rediae, however, differs from the others, and enables the parasite to leave its host, which has now become seriously affected and probably dies. This new type is known as a *Cercaria*, and is a larval fluke. It is flat, provided with an oral and a ventral sucker, a pharynx, a forked intestine, a double ganglion, the chief branches of the excretory system, and a characteristic long mobile tail. The Cercariae leave the body of the snail and reach the water in which they swim about actively for a time by means of their

long tails. Finally they become attached to the stems of plants in the water. They loose their tails and become encysted in a small capsule which can withstand dessication when the pools or flooded areas become dry. If the grass or vegetable matter with these cysts is eaten by sheep the cysts are dissolved and the enclosed parasite, now a young fluke, escapes into the intestine and from thence into the bile ducts of the sheep, and thus the cycle is completed.

At first the flukes have no marked effect on their host and it is only several weeks after infection that signs of anaemia, fever and quickening of breath are observed. The sheep becomes rapidly fatter at this time but this is followed after a variable period by marked loss of flesh and enfeeblement. Death generally ensues, but recovery is possible if the flukes are not too numerous and die a natural death or migrate after shedding their ova, for it is to be noted that the stage of the fluke in the liver of the sheep does not multiply asexually as in the snail. A few flukes in the liver will therefore do no harm. They cannot, however, be removed by any known medicine, and preventative measures, based on our knowledge of the life history of the parasite, have to be adopted. The most dangerous time is when the embryos hatch out from the snail, May to July in Europe, January to April in South Africa. The sheep should therefore be kept away from damp or marshy pasture at this time. Another measure suggested by the life history of the parasite is to take means to destroy it before it reaches the liver. Salt is fatal to the parasite; they are never found where the water is slightly salt, and a dressing of salt (5-8 cwts. of rock salt to the acre) is said to rid the soil of the pest. Salt may be given also to the sheep to lick. The most reliable measures are, however, to keep the sheep off damp ground or to drain the ground. The parasite of course cannot exist without the snail, the destruction of which, however, is rather difficult though they may be kept down by the application of salt or lime.

(To be continued).

ANIMAL DISEASES—CONTAGIOUS AND INFECTIOUS.

Summary of Outbreaks of Contagious and Infectious Animal Diseases Scheduled under Act No. 27 of 1893.

Still under Quarantine on 31st July, 1909.

DISTRICT.	Anthrax.	Epizootic Lymphangitis.	Glanders.	Lungsickness.	Redwater.	Scabies (Equines.)	Sponsziekte.	Tuberculosis.	Totals.
Kimberley	1	...	...	...	...	...	...	...	1
Albert	...	...	...	...	...	...	2	...	2
Barkly East	...	...	...	3	...	...	...	...	3
Barkly West	...	...	...	1	...	...	...	...	1
Bathurst	...	...	...	...	...	...	1	...	1
Cape	...	...	...	...	...	...	...	1	1
East London	4	...	...	...	...	...	5	...	9
Fort Beaufort	...	...	...	...	...	...	1	...	1
Humansdorp	...	3	...	...	...	1	...	...	4
King William's Town	...	...	...	11	...	...	6	...	17
Komgha	...	...	...	...	...	...	1	...	1
Mafeking	...	...	...	...	...	...	1	...	1
Mossel Bay	...	...	1	...	...	...	...	...	1
Peddie	...	...	...	1	...	...	...	...	1
Port Elizabeth	...	...	...	...	...	1	...	...	1
Prieska	...	...	...	1	...	...	...	...	1
Somerset East	...	...	...	...	...	...	1	...	1
Stockenstrom	...	...	...	...	...	...	1	...	1
Stutterheim	...	...	...	5	...	...	...	...	5
Vryburg	...	...	...	1	...	...	...	...	1
Wodehouse	...	...	...	1	...	...	...	...	1
Tembuland.									
Umtata	...	...	...	9	...	...	...	...	9
Engcobo	...	...	...	27	...	...	...	...	27
St. Mark's	1	...	...	9	8	...	2	...	20
Mqanduli	...	...	...	6	...	...	10	...	16
Elliotdale	...	...	...	3	...	...	1	...	4
Transkei.									
Butterworth	...	...	...	4	...	...	...	...	4
Kentani	...	...	...	7	...	...	4	...	11
Nqamakwe	...	...	...	8	...	...	5	...	13
Tsomo	...	...	...	2	3	...	...	...	5
Idutywa	...	...	...	7	...	...	1	...	8
Willowvale	...	...	...	25	...	...	12	...	37
Port St. John's	...	...	...	3	...	...	...	...	3
Pondoland.									
Libode	...	...	...	4	...	...	...	...	4
Ngqeleni	...	...	...	8	...	...	...	...	8
Lusikisiki	...	...	...	2	...	...	...	...	2
Flagstaff	...	...	...	1	...	...	...	...	1
Tabankulu	...	...	...	12	...	...	...	...	12
East Griqualand.									
Mount Ayliff	...	...	...	1	...	...	...	...	1
Umzimkulu	...	...	...	...	...	...	2	...	2
Qumbu	...	...	...	8	...	...	...	...	8
Tsolo	...	...	...	22	...	...	...	...	22
Mount Frere	...	...	...	1	...	...	...	...	1
Maclear	...	...	...	2	...	...	...	...	2
Totals	6	3	1	195	11	2	56	1	275

(Sgd.) GEORGE ROWE, for Chief Veterinary Surgeon.

Office of the Chief Veterinary Surgeon,
Cape Town, 3rd September, 1909.

LUCERNE CULTIVATION.

DRILLING VS. BROADCAST, AND NARROW VS. BROAD BEDS.

ROBERTSON EXPERIMENT STATION, NO. 4, 1909.

By R. W. THORNTON, Government Agriculturist.

The following experiments were carried out by Mr. Visser, Manager of the Robertson Experiment Station, and the results obtained, especially from the cultivation experiment, are striking.

1. CULTIVATION OF ESTABLISHED LUCERNE.

Since carrying out the cultivation experiment on lucerne at the Experiment Station during the season 1907-08, a report on which appeared in the June, 1908, *Agricultural Journal* (No. 6, vol. xxxii), page 707, the question has arisen as to whether frequent cultivation is more advantageous than one cultivation at the commencement of the season (*i.e.* August to September). An experiment in this direction was accordingly arranged.

For this purpose seven plots, consisting of uniform lucerne two years old, were taken. The first plot was cultivated after every cutting, *i.e.*, after every watering, the second plot after every second cutting, and the third and fourth plots each received one cultivation at the commencement of the season. These four were cultivated with the Martin Cultivator. The remaining three plots were arranged in the same way, except that the Disc Cultivator was used instead of the Martin.

From the following table of results it would appear that constant cultivation of established lucerne with cultivators of the Martin and Disc type does not increase the yield, but actually tends to lessen it. This is probably due to the severe and constant injury of the lucerne crowns by machines of this kind, and it remains to be seen this season whether machines which loosen the ground without inflicting any material injury on the lucerne itself will increase the crops or not. This experiment is deserving of further and extended trials before a definite conclusion is arrived at.

TABLE I.—CULTIVATION EXPERIMENT.

Plot.	Nature of Experiment.	Weight of Lucerne Hay in lbs. per acre. 1st cutting.	2nd cutting.	3rd cutting.	4th cutting.	Total.
1	Cultivated with Martin after every cutting.	2,400	3,740	3,075	1,150	10,365
2	Do. after every second cutting	2,525	3,675	3,500	1,250	10,950
3	One cultivation only—Martin	2,725	4,650	4,090	1,675	13,140
4	One cultivation only—Martin	3,300	4,865	4,090	1,575	13,830
5	One cultivation only—Disc	2,645	4,400	3,440	950	11,435
6	Cultivated with Disc after every second cutting.	2,500	3,775	3,365	850	10,490
7	Do. after every cutting	2,825	3,340	3,725	1,100	10,990

The following is the chemical analysis of the soil on which the manurial and cultivation experiments were conducted:—

Moisture	·95	per cent
Organic Matter .	2·98	
Nitrogen	·070	
Lime	·276	
Potash	·091	
Phosphoric Acid	·033	
Chlorine	·0099	

DRILLING VS. BROADCAST SOWING AND NARROW VS. BROAD BEDS.

This experiment was commenced in 1907-08, and a preliminary report was published in June, 1908, *Agricultural Journal* (No. 6, Vol. xxxii.).

Nothing further was done to the plots during the winter following, except to cultivate the whole area once, and the lucerne having now become well established, weights were again carefully taken from each plot. The following are the tabulated results:—

TABLE II.—DRILLING VS. BROADCAST SOWING, AND NARROW VS. BROAD BEDS.

Plot.	Nature of Experiment.		Weight of Lucerne Hay in lbs. per acre. 1st cutting.	2nd cutting.	3rd cutting.	4th cutting.	Total.
1	Beds 10 ft. wide.	Drilled in 8 in. drills	3,500	4,200	4,400	3,800	15,900
2	Beds 10 ft. wide.	Broadcasted by hand	3,250	4,230	4,550	3,780	15,810
3	Beds 20 ft. wide.	Drilled in 8 in. drills	3,225	4,300	4,365	3,490	15,380
4	Beds 20 ft. wide.	Broadcasted by hand	3,175	5,125	5,185	3,630	17,115

The ground on which these experiments were conducted is under irrigation, and the beds were watered after the two first cuttings after which the supply ran short, owing to protracted drought.

Neither of these experiments are conclusive, as in the narrow versus broad beds the result in the one case is in favour of the narrow beds (compare plots 1 and 3), whereas by comparing plots 2 and 4 we find the broad bed has given the heavier crops. The same applies to the drilling versus broadcast experiment, but it is hoped that by using a dynamometer on the cultivators this season we will find whether the traction power has to be increased materially where broadcast sowing is practised instead of drilling.

THE MANURING OF LUCERNE.

By A. K. Hards, Assistant to Government Agriculturist.

Seeing the great success which attended the efforts of the Department in the manuring of Lucerne at Robertson on 1907-08, and also to gain a wider experience in this matter so as to enable the Department to give more accurate information to farmers on this subject, the Department decided to try the manures on various soils and under different climatic conditions. With this object in view, some twenty experiments were carried out in different localities, the work being personally supervised by officers of the Department. Only one of all this number proved a success, three showed no increased yield, probably due to the fact that the manure did not have time to reach the roots of the old established lucerne, and may therefore show up during the coming season, whilst the remainder failed through drought, insect pests, weeds, etc. Some of these experiments were conducted on established lands of a few years' standing, whilst others again were on lucerne newly laid down. The manures used were the same kinds and the same weights as those used at Robertson, which experiment was reported on in the July, 1909, number of the *Agricultural Journal*. The superphosphate used was of the high grade containing 17 per cent. to 18 per cent. phosphoric oxide. The experiment from which the results given below were obtained was conducted on Mr. T. Cheetham's farm "Triangle" at Bellville. The soil is the Cape Flats sandy soil, on which Port Jackson willows and coarse grass and "biesjes" had been growing up to the time of clearing for the crop. The land was cleared and then ploughed twice and well harrowed. The manures were harrowed in and the seed sown with a small hand drill on the 30th and 31st July, 1908. The poverty of the soil is clearly demonstrated by the nominal crop obtained from the unmanured plot No. 1, which only produced 800 lbs. of hay. The light dressings did not improve the crop to any great extent, but the heavier dressings gave very good results, taking into consideration that last summer was one of the driest experienced in the Western Province for many years. Possibly the crop, had it had rain or irrigation, would have been doubled, but the only thing which could be done, and was done, was to cultivate freely.

Four crops were reaped during the year and, strange as it may seem, the first cutting from sowing yielded the highest return. Superphosphate, as at Robertson and elsewhere, again takes the lead, followed by Basic Slag and with the complete fertilisers making a close third. The following are the details of the yields:—

Plot.	Yield of Hay in pounds per acre.				
	1st Cutting 8th December.	2nd Cutting 15th January.	3rd Cutting 8th February.	4th Cutting 3rd May.	Total.
1	300	200	160	140	800
2	652	224	260	332	1468
3	456	392	232	180	1260
4	1684	1188	1020	924	4816
5	704	1188	980	752	3624
6	2388	1140	1040	848	5416
7	1412	1532	1360	908	5212
8	2120	1168	928	848	5064
9	1208	840	720	780	3548

The following table shows the monetary gain from the manuring, and that it pays is shown quite conclusively. The lucerne hay is taken at 5s. per 100 lbs. in Cape Town, from which, to get the correct figures, the railage must be deducted and also the railage added to the cost of the manures, as the prices stated are f.o.r. Cape Town.

Plot.	Manurial Treatment per acre.	Yield in lbs. per acre.	Increase in Yield in lbs.	Value of Increase at 5/- per 100 lbs. Lucerne Hay.	Cost of Manures.	Profit.	Loss.
				£ s. d	£ s. d	£ s. d.	£ s. d.
1	No Manure	800	...	...	...	...	...
2	200 lbs. Superphosphates ...	1468	668	1 13 5	0 10 6	1 2 11	...
3	200 lbs. Basic Slag	1260	466	1 3 4	0 8 6	0 14 10	...
4	400 lbs. Superphosphate ...	4816	4016	10 0 9	1 1 3	8 18 6	...
5	400 lbs. Basic Slag	3624	2824	7 1 2	0 16 9	6 4 5	...
6	800 lbs. Superphosphate ...	5416	4616	11 10 9	2 2 0	9 8 9	...
7	800 lbs. Basic Slag	5212	4412	11 0 7	1 14 0	9 6 7	...
8	100 lbs. Govt. Guano ... ... 40 lbs. Sulphate of Potash ... 200 lbs. Superphosphate ... 100 lbs. Nitrate of Soda ...	5064	4264	10 13 2	1 11 6	8 1 8	...
9	10 tons Stable Manure ...	3548	2748	6 17 5	2 10 0	4 7 5	...

In comparing the above results with those obtained from the Robertson experiments these appear infinitesimal, but it must be remembered that these results are from young lucerne, the first crop being taken four months after sowing the seed, whereas the Robertson results were from two-year old lucerne, and the conditions and nature of soil must also be taken into account. In comparing the control plots, we find that the Robertson soil produced 5,630 lbs. to the acre against 800 lbs. in this case, so the old manured crop at Robertson produced seven times as much as the young unmanured crop did at Bellville, but in comparing the yields in each case obtained from the plots manured with 800 lbs. Superphosphates we find it to be 14,640 at Robertson, not quite three times the crop obtained at Bellville, which was 5,416 lbs. Then again, it must be taken into account that the Robertson experiment received water after each cutting, and there were five cuttings taken during the season as against this experiment which received no water and very little rain, and from which only four cuttings were obtained. Of course it remains to be seen for how long phosphates alone will act in this soil, which is almost pure sand. This is one of the things that the farmers must look to when continually manuring crops, and not keep on applying a single plant food without the addition of others, as an excess of one will not make up for a deficiency in any of the others. This will not, of course, be felt so much with leguminous crops like lucerne, which is capable of taking up the free nitrogen from the air.

MANURIAL EXPERIMENTS WITH BARLEY.

PROFIT AND LOSS IN THE WESTERN PROVINCE.

By A. K. Hards, Assistant to Government Agriculturist.

This is a crop to which comparatively little attention is paid. It does well in certain districts if properly looked after, and if better malting varieties such as Chevalier and Webb's Beardless were sown, for which, if of good quality, there is a large demand and a better price is paid by the brewers, both the individual grower and the country at large would be better off. The money sent out of the country for malting barley would then remain here in circulation, besides which other industries could then be started. In the rotation barley might be used as an alternate crop with wheat and oats.

With a view of finding out the best manure or combination of manures most suitable for barley, two experiments were conducted in the Western Province, but owing to the lateness of sowing the results obtained were not altogether satisfactory from a financial point of view, yet for comparison the following tabulated statements are of considerable value.

The results of the experiments are as follows:—

C. Lange, Gloria, District Caledon.

Plot.	Manurial Treatment.	Crop Return. Total. lbs.	Crop Return. Grain. lbs	Increase in Yield. lbs.	Value of Increase at 4/6 per 100 lbs. £ s. d	Cost of Manures. £ s. d.	Profit. £ s d.	Loss. £ s. d
1	No Manure ...	1276	587	...	...	...	...	...
2	200 lbs. Supers. ...	2428	1169	582	1 6 2	0 9 6	0 16 8	...
3	200 lbs. Basic Slag ...	2704	1247	660	1 9 8	0 7 0	1 2 8	...
4A	100 lbs. Nitrate of Soda ... 100 lbs. Govt. Guano ...	2140	959	372	0 16 8	0 13 2	0 3 6	...
5	200 lbs. Basic Slag ... 100 lbs. Govt. Guano ... 40 lbs. Sulphate of Potash ... 100 lbs. Nitrate of Soda ...	2236	1045	458	1 0 7	1 5 2	...	0 4 7
6	200 lbs. Superphosphate ... 100 lbs. Nitrate of Soda ...	2528	1221	684	1 8 6	0 16 8	0 11 10	...
7	200 lbs. Basic Slag ... 100 lbs. Nitrate of Soda ...	2848	1313	726	1 12 8	0 14 2	0 18 6	...
8	40 lbs. Sulphate of Potash ... 100 lbs. Nitrate of Soda ...	1324	662	75	0 3 4	0 12 2	...	0 8 10

The site selected for the above experiment was a gravelly hillside. The seed was sown at the rate of 80 lbs. to the acre. In this experiment, comparing plots 2 and 3 and 6 and 7 we find that Basic Slag alone, as in 3, or in combination with Nitrate of Soda (as in 7), proved more beneficial to the crop than the superphosphate.

Aldermann Bros., Zeekoe Vlei, District Stellenbosch.

Plot.	Manurial Treatment.	Crop Return. Total lbs.	Crop Return. Grain. lbs.	Increase in Yield. lbs.	Value of Increase at 4/6 per 100 lbs. £ s. d.	Cost of Manures. £ s. d.	Profit. £ s. d	Loss. £ s. d.
1	No Manure	1000	460	...	...	...	...	...
2	200 lbs. Superphosphate ...	1364	668	208	0 9 4	0 9 6	...	0 0 2
3	200 lbs. Basic Slag	1752	808	348	0 15 8	0 7 0	0 8 8	...
4B	100 lbs. Nitrate of Soda ...	1044	468	8	0 0 4	0 7 2	...	0 6 10
5	200 lbs. Basic Slag ... ... 100 lbs. Govt. Guano ... 40 lbs. Sulphate of Potash ... 100 lbs. Nitrate of Soda ...	2656	1256	796	1 15 10	1 5 2	0 10 8	...
6	200 lbs. Superphosphate ... 100 lbs. Nitrate of Soda ...	2336	1128	668	1 10 1	0 16 8	0 13 5	...
7	200 lbs. Basic Slag ... ... 100 lbs. Nitrate of Soda ...	2160	996	536	1 4 1	0 14 2	0 9 11	...
8	40 lbs. Sulphate of Potash ... 100 lbs. Nitrate of Soda ...	1232	616	156	0 7 0	0 12 2	...	0 5 2

This experiment was conducted on clay land fallowed the previous season. 40 lbs. of seed was sown to the acre and harrowed in on June 26th. The crop was reaped during the first week in November.

Comparing this with the Gloria experiment, the figures do not show to such advantage, which can be put down to drought and lateness of sowing, and the crop, due to these reasons, was unable to make full use of the manures. Nitrates helped a great deal in this experiment, especially in combination with superphosphate, which clearly demonstrates what was commented on in the introduction of the report on the wheat experiments published in the February *Agricultural Journal* (No. 2, Vol. XXXIV.), that phosphoric oxide or any single manure if used continually tends to reduce the fertility of the soil, but *in combination* with other plant food will give continued good results.

SUMMARY OF BARLEY MANURIAL EXPERIMENTS, WESTERN PROVINCE.

Plot.	Manurial Treatment.	Crop Return Total lbs.	Crop Return Grain lbs.	Proportion of Grain to Straw.	Increase in Yield. lbs.	Value of Increase at 4/6 per 100 lbs. £ s. d.	Cost of Manures. £ s d	Profit. s. d.	Loss s. d.
1	No manure	1188	523	1:1·17	...	...	...	...	...
2	200 lbs. Superphosphate	1896	918	1:1·06	395	0 17 9	0 9 6	8 8	...
3	200 lbs. Basic Slag ..	2228	1027	1:1·17	504	1 2 8	0 7 0	15 8	...
4A	100 lbs. Nitrate of Soda 100 lbs. Govt. Guano ...	2140	959	1:2·23	872	0 16 9	0 13 2	3 7	...
4B	100 lbs. Nitrate of Soda	1044	468	1:1·2	8	0 0 4	0 7 2	...	6 10
5	200 lbs. Basic Slag ... 100 lbs. Govt. Guano ... 40 lbs. Sulphate of Potash. 100 lbs. Nitrate of Soda	2446	1150	1:1·12	627	1 8 3	1 5 2	3 1	...
6	200 lbs. Superphosphate 100 lbs. Nitrate of Soda	2432	1174	1:1·07	657	1 9 4	0 16 8	12 8	...
7	200 lbs. Basic Slag ... 100 lbs. Nitrate of Soda	2504	1154	1:1·17	631	1 8 5	0 14 2	14 3	...
8	40 lbs. Sulphate of Potash. 100 lbs. Nitrate of Soda	1278	639	1:1	116	0 5 3	0 12 2	...	6 11

In looking at the above summary, it is clearly shown that manuring of barley pays, but which manure or manures will prove the most beneficial has yet to be determined. In the case of the Gloria experiment slag in combination with nitrates gives nearly double the profit given by superphosphate and nitrate of soda, whereas in the case of the Zeekoe Vlei experiment the result is reversed, but basic slag when applied alone has given far better results than the superphosphate under the same conditions. In neither case does the complete manure show to great advantage, but this is undoubtedly largely due to such a heavy dressing of manure being followed by a very dry season. It will, however, be noticed that throughout the summary basic slag alone or in combination with other fertilisers has given better results than superphosphate. This tendency was noted throughout last season's experiments.

The above table shows the average of two experiments with the exception of 4A and 4B which are the results each of one plot.

EXPLANATION OF DIAGRAMS.

Diagram No. 1 represents the average profit and loss obtained over and above the yield of the control plot, and less the value of the manures.

The figures 6s. to 4s. represent the scale, and the figures next each column the value of the profit or the loss as the case may be. The line at 24s. represents the value of the control or No. 1 plot, and the profit of each plot due to manuring is placed above that line and the loss below it. The two losses are from plots 4B and 8.

Diagram No. 2 represents the average percentage of grain to straw of the different plots. The figures 8 to 100 represent the scale, the dark column the grain and the light one the straw. The figures above the columns as in plot 1, 44 and 56, represent the amount of grain and straw respectively, which would be obtained from 100 lbs. of sheaves.

The numbers 1 to 8 in both diagrams are the numbers of the respective plots as they appear in the summary table.

DIAGRAM No. 1.—SHOWING AVERAGE PROFIT AND LOSS.

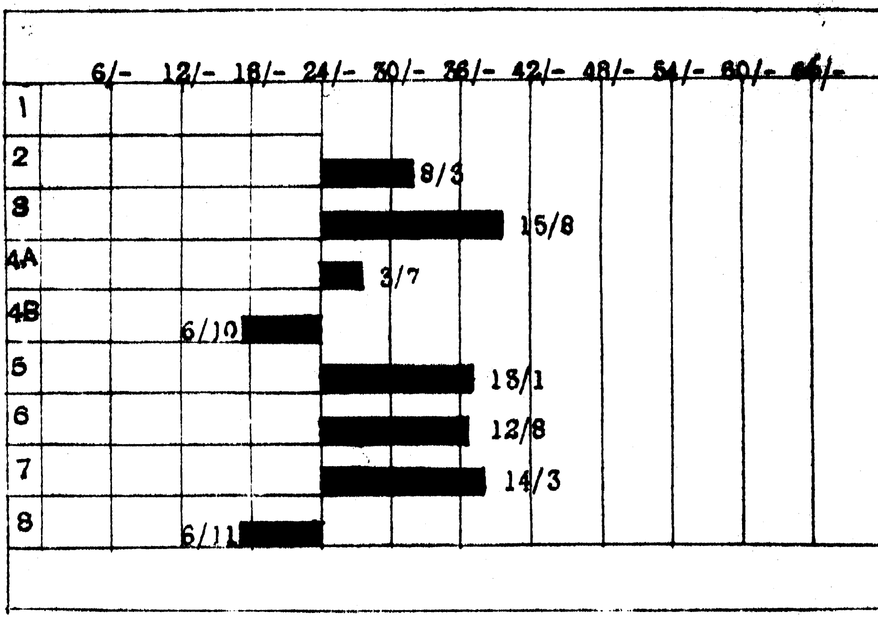

DIAGRAM No. 2.—SHOWING AVERAGE PERCENTAGE OF GRAIN TO STRAW.

CAPE PRODUCE CONDEMNED IN THE TRANSVAAL.

Return of Vegetable Produce from Cape Colony condemned by Transvaal Plant Inspectors at Johannesburg and elsewhere during the month of June, 1909.

POTATOES.

June 1.—Greyvenstein Bros., Molteno, 45 bags, Eelworms, 5 per cent.
June 1.—G. R. Jardine, Molteno, 50 bags, Eelworms, 12½ per cent.
June 1.—A. G. P. Erlank, Molteno, 46 bags, Eelworms, 5 per cent.
June 1.—A. G. P. Erlank, Molteno, 43 bags, Eelworms, 6 per cent.
June 2.—E. Proctor, King William's Town, 23 bags, Nectria solani, 3 per cent.
June 4.—D. D. H. Fraser, Aliwal North, 22 bags, Phytophthora infestans, 25 per cent.
June 4.—Greenslade Dawe, Aliwal North, 10 bags, Nectria solani and Phytophthora infestans, 6 per cent.
June 8.—Herschman, Caledon, 25 bags, Bacillus solanacearum, 2 per cent.
June 8.—Stern, Dordrecht, 40 bags, Eelworms, 5 per cent.
June 8.—Fish, Dordrecht, 95 bags, Eelworms, 20 per cent.
June 9.—E. Parker, Arundel, 10 bags, Eelworms, 6 per cent.
June 9.—R. Gush, Elliot, 28 bags, Eelworms, 7 per cent.
June 9.—P. C. & Co., Adelaide, 52 bags, Tuber Moth and Phytophthora infestans, 7 per cent.
June 10.—G. R. Jardine, Molteno, 47 bags, Eelworms, 20 per cent.
‡June 11.—Quail Bros., Molteno, 1 parcel potatoes, Eelworms, 18 per cent.
*June 14.—Paetzoed, Tarkastad, 1 bag, Eelworms, 9 per cent.
*June 14.—E. Proctor, King William's Town, 25 bags, Eelworms, 10 per cent.
*June 18.—B. F. Roberts, Letts Kraal, 12 bags, Eelworms, 8 per cent.
*June 18.—J. H. Coetzee & Co., Drew, 20 bags, Eelworms, 5 per cent.
*June 19.—D. Stein, Burghersdorp, 18 bags, Eelworms, 5 per cent.
*June 21.—W. & B., Sterkstroom, (consignee Tomasilli), 5 bags, Eelworms, 5 per cent.
*June 21.—G. A. Park, Aliwal North, 1 bag, Eelworms, 15 per cent.
*June 21.—Fish & Co., Dordrecht, 46 bags, Eelworms, 5 per cent.
*June 23.—Deary, Molteno, 25 bags, Eelworms, 12 per cent.
*June 23.—W. T. Hogsett, Dordrecht, 70 bags, Eelworms, 14 per cent.
*June 25.—Meintjes & Co., Naauwpoort, 90 bags, Eelworms, 12 per cent.
*June 28.—N. D. Deary, Molteno, 25 bags, Eelworms, 2 per cent.
June 28.—J. S. Kloppers, Worcester, 295 bags, Eelworms, 6 per cent.
June 29.—Hillman Bros., Norvals Pont, 6 bags, Phytophthora infestans, 8 per cent.
*June 30.—E. J. Marais, Worcester, 140 bags, Eelworms, 13 per cent.
*B. F. Roberts, Letts Kraal, 31 bags, Eelworms, 3 per cent.
†June 7.—Visser, Hanover Road, 42 bags, Bacillus solanacearum, 5 per cent.
†June 7.—G. White & Son, Kimberley, 50 bags, Eelworms, 8 per cent.

LEMONS.

‡June 2.—Bathurst Farmers Union, Grahamstown, 4 boxes, Red Scale, 8 per cent.

APPLES.

June 11.—J. Sarembock, French Hoek, 28 boxes, Aonidiella aurantii, 7½ per cent.

PEARS.

†June 7.—Cape Orchard Company, 20 cases, Codling Moth, 5 per cent.
All the above were reconsigned with the exception of those marked ‡, which were destroyed, and those marked * which were sorted.
†Examined at Pretoria.

TABULATED SUMMAR OF CAPE PRODUCE REJECTED BY THE TRANSVAAL ON ACCOUNT OF THE ACCOMPANYING PESTS.

Article.	Disease.	Extent to which infected by Sample examined. 1 %		1 % to 2 %		2 % to 5 %		5 % to 10 %		Above 10 %		Sorted.		Destroyed.		Re-consigned.		Total Rejected.	
		Consignments	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.	Consignments.	Packages.
June, 1909 Potatoes	Eelworm	...	...	1	25	8	251	7	463	10	520	15	804	1	1	10	454	26	1.259
	Nectria solani ...	...	..	...	...	1	23	1	10*	.		..	.	...	..	1	23	2	33
	Phytophthora infestans	...	...	..	...	...	..	3	68	1	22	.	...	.	.	4	90	4	90
	Tuber Moth ..	..	...	...	...	...	...	1	52*	...	..	.	.	.	.	.	..	1	52
	Bacillus solanacearum	...	...	1	25	1	42	...	.	...	.	...	...			2	67	2	67
Lemons...	Red Scale ..	...	...	...	...	...	..	1	4	.	...	..	..	1	4	...	...	1	4
Apples ...	†Aonidiella aurantii	...	...	...	...	...	...	1	28	...	.	...	...	...		1	28	1	28
Pears ...	Codling Moth ...	...	...	..	...	1	20	...	...	...	..	...	...	...	..	1	20	1	20
Totals for	June 1909 ...	...	...	2	50	11	336	12	563	11	542	15	804	2	5	19	682	36	1,491

* Also listed under Phytophthora infestans, and therefore excluded from totals. † A name for Red Scale.

CORRESPONDENCE.

Divining and Drilling.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Referring to the various letters, under the heading of "Divining and Drilling for Water," which have appeared in past publications of the *Agricultural Journal*, the last letter written by Mr L. C. Nel, accepting Mr St. Leger Seaton's challenge, was dated the 17th May, and as no further correspondence in connection with the subject appeared in the July issue, I, with several other farmers of this part of the country, would be greatly interested to know how the matter now stands.

Perhaps one of the above named gentlemen will be good enough to inform us through the medium of your next publication?—Yours etc.,

FRANK MAY

Griqualand West.

South Africa and British East Africa.

A COMING MARKET.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—What I intend to say may be of interest to your readers I bought and shipped to my farm in British East Africa 5,191 Merino sheep which were principally purchased in Wodehouse and Barkly East District. From my experiences in this matter the question arises will it pay to buy in South Africa in large numbers. There are so many things against it. First, a stranger coming in wanting to buy from farmers, will find so few who will carry out the agreements they sign. Second, one has to pick up the stock in tens to hundreds here and there so that one buying 2,000 has so many different classes. Third, railway rates are much against reducing the price. Fourth, the 6d. Harbour charges are absolutely absurd on 5,191. This all kills a market from South Africa to British East Africa.

The only advantage in favour of South Africa as against Australia is the line of direct boats. The feed for 10 days instead of 25 days from Australia is perhaps 1s. to 2s. 6d. in favour of Africa.

I should say Cape Colony should keep an eye on British East Afirca during the next few years as a market for their surplus sheep. But the farmer, railway and harbour board all have to assist if they don't want this trade to slip away.

I feel convinced I could have saved £1,000 on this shipment, had I gone to Australia and then I would have had one class of stock.

I have 25,000 sheep up there; my property joins the Government stock farm, which carries 4 to 4½ sheep to the acre. The country requires a lot of stock in the near future and I don't see why South Africa should not supply it, being close by, and as it will only be another year or so before stock men here will have to look to the oversea market.—Yours, etc.,

F. E. DOERING, M.D., D.D.S.

This shipment sailed from East London on the 1st July, by a specially chartered boat. I have quotations from the German East African Line: lowest 15s. per head and up to 20s. How can South Africa compete with Australia on these lines?

The Feed for a Horse.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—As a rule too little or too much fodder is given to horses and mules. Let us please hear how much you would give to a full grown horse or mule at any one time three times per diem.

We only want to know the amount of grain, being wheat, rye, oats and barley We are of opinion that 3½ lbs. at any one time, three times a day, or 10½ lbs. per day will be sufficient for a horse —Yours, etc.,

N. A. BLANCKENBERG.

Roodekleigat, Malmesbury, 13th August

Our correspondent's ration is just about correct But in addition to the above a plentiful supply of good grass hay or cut straw should also be available for the animal. There is never any need to apportion hay or straw as a horse will seldom take more of this than he needs.

The Extirpation of Scab.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—By giving a little space for the following, you will greatly oblige me I am not going to argue about the scab-act or the curing of scab, for I am tired of that. It is only a short reply to the letter of Mr Murray, appearing in your July issue.

By keeping quiet after such a letter one commits suicide It would be as if Mr. Murray alone had a lot of sheep in the "Onderveld," if no reply were made. It is originally from this kind of thing that sometimes incompatible legislation is enforced on the country. To my surprise not only but also undoubtedly to that of many others, I notice that this renowned farmer of Roodebloem is prepared to extirpate the scab in the Colony in a year's time. He may be able to do so in his *lucerne* lands, but not in the hard Karroo country, or in those old sour "pollen" of the Sneeuwbergen, where sheep and goats have to search for their own food, particularly in such years as 1908. But I am digressing I only want to remark that it seems to me that Mr. Murray would be a greater plague to the country than scab itself, if it should be left to him to exterminate scab in a year's time, with his fines of £25 and £50. Methinks he would destroy either sheep or sheepfarmers, but not scab. As regards the Australian farmer I will keep silent, because I have not seen myself that there is no scab there, and time has taught me to believe only what one sees.

With regard to burning of kraals; what about sheds? For every man has certainly sheds and kraals. And also in every kraal shelter for lambs, made of from 20 to 50 sheets of iron, put up on olive wood poles. Has all that to be destroyed? Well, even if you burn kraal, and shed with louse and eggs and all, what about the lice in the veld, which are said to be able to live for such a long time without food or cover? No, Mr. Murray, my little children and yours too will become grandfathers and grandmothers and they will still see scab. Don't think I have no sheep or that they are hard on account of scab. If Mr. Murray wants my address I will send it privately to him. Then he may come and have a look, as I am living not far from him.—I am, etc.,

GEEN WINDMAKER

Aberdeen, August 18th, 1909.

Ineffective Jackal Poison.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Sometimes a farmer here suffers heavy losses through jakhals. It happened that during a night by an accident 17 ewes got lost from the flock and took a wrong course. The following night they had not come back, those who had been searching for them having been unable to find them on account of a heavy mist in the forenoon

and rain in the afternoon. Jackals killed 9 lambs and one ewe during the night. Government poison was then put in the dead lambs and the last bit was devoured by jackals. A fortnight after, when the flock was left in the veld, the jackals caught another lamb. Poison was again placed in the dead lamb and this was devoured just as in the previous case. The flock was thereupon again "kraaled," but a strong north wind in June blew down the kraal of branches, leaving an opening, large enough to give a chance to the jackal, who caught two. These were treated in the same way with the "red poison." and the sheep were eaten up, poison and all. The jackals might all have been killed, if the poison had not been so bad. I have got one, at a distance of more than 3,000 yards from where it had picked up the poisoned bait. Is there any of the readers of your valuable *Journal* who could tell me where to get good poison? It is highly necessary that good poison for jackals should be offered for sale.—Yours, etc.,

H. J. VISAGIE.

Komkans, P O. Nieuwe Rust, Dist. Van Rhynsdorp.

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*Elsenburg Student completing full course at end of year, seeks employment on Stock Farm, 20 years of age Reply to O. L. Bousfield, Elsenburg College, Mulder's Vlei.

*Elsenburg Student, 18 years old, completing full course in November, seeks employment on a Stock Farm. Was brought up on a farm and speaks Dutch fluently. Reply to C. Mugglestone, Elsenburg College, Mulder's Vlei.

*Elsenburg Student, 20 years of age, completing full course at end of year, seeks employment on Stock Farm. Speaks Dutch fluently. Reply to Ned Kelly, Elsenburg College, Mulder's Vlei.

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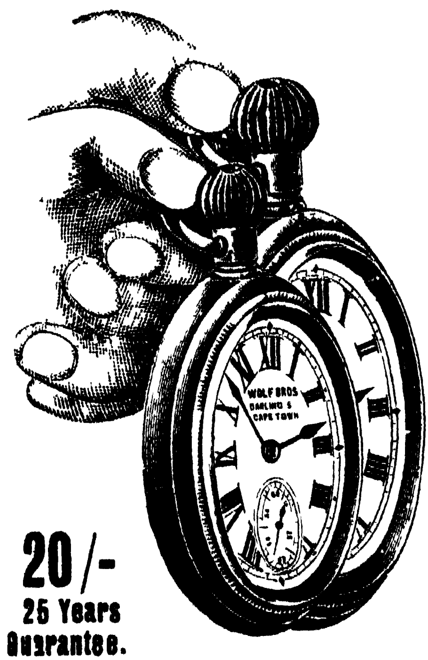
*Elsenburg Student, 19 years of age, completing full course at end of year, seeks employment on farm. Speaks Dutch. Reply to S. G. B. Campbell, Elsenburg College, Mulder's Vlei.



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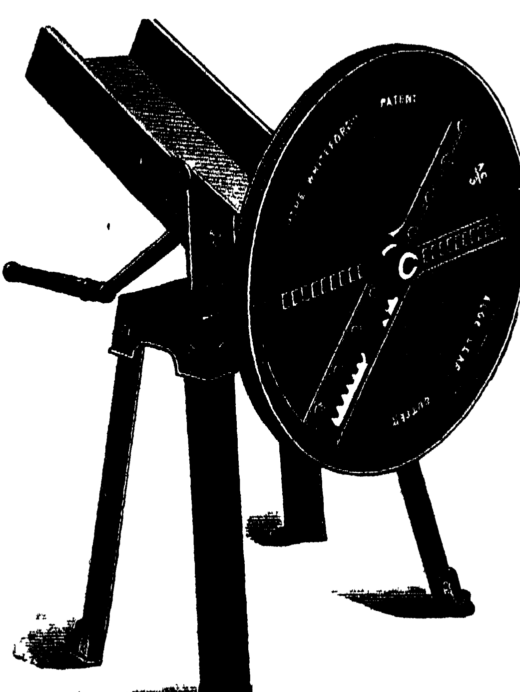

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NOTES ON THE WEATHER OF JULY, 1909.

By CHARLES M. STEWART, B.Sc., Secretary to the Meteorological Commission.

The weather of July was characterised by the prevalence of marked anticyclonic conditions—unusually high mean atmospheric pressure; days of average temperature with nights slightly colder than usual, daily and sometimes severe frosts; a mean rainfall less than half the average, with slight showers of snow and sleet at a few of the higher stations; a practical absence of thunder and hail; clear skies; infrequent fogs; an unusually large percentage of calm days, but with some gales at the beginning and towards the end of the month together with occasional berg winds.

DIVISION.	Mean Rainfall (1909).	Mean No. of Days.	Average Rainfall (1891-1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	5·04	8	6·39	12	—1·35	— 21
South-West ...	2·23	5	3·10	7	—0·87	— 28
West Coast ...	1·17	4	1·50	5	- 0·33	— 22
South Coast ...	1·37	5	1·41	5	- 0·04	- 3
Southern Karoo ...	0·27	1	0·64	3	—0·37	— 58
West Central Karoo ...	0·06	1	0·31	2	—0·25	— 81
East Central Karoo ...	0·06	1	0·24	2	0·18	75
Northern Karoo ...	0·05	1	0·34	2	—0·29	— 85
Northern Border ...	0·00	0	0·17	1	-0·17	-100
South-East ...	0·20	2	0·62	2	—0·42	- 68
North-East ...	0·04	1	0·56	2	- 0·52	— 93
Kaffraria ...	0·50	3	0·52	2	—0·02	— 4
Basutoland ...	0·04	1	0·64	2	—0·60	— 94
Orange River Colony ...	...	...	0·48	2	...	...
Durban (Natal) ...	1·81	3	1·30	...	+0·51	+ 39
Bechuanaland ...	0·00	0	0·33	1	—0·33	—100
Rhodesia ...	0·02	1	0·02	1	+0·00	+ 0

Precipitation.—The mean rainfall, based on returns from 335 stations amount to only 0·88 in. on 3 days, being 0·62 in. or 41 per cent. below the normal. This amount is 0·30 in. more than that recorded during the preceding month and 0·15 in. less than in July, 1908. The accompanying table shows that, with the single exception of Durban (Natal), there was a deficiency in the amount of precipitation over the various sections of the country, varying between *minus* 3 per cent. along the South Coast and 100 per cent. over the Northern Border and Bechuanaland. A state of partial or absolute drought may be said to have been practically general over eleven out of sixteen divisions, the rainfall being of the typical winter character in its distribution. Compared with June last, there was an increase in the amount over ten sections, but this was so slight as to be negligible except over the Cape Peninsula, South and West Coasts and Kaffraria. Contrasted with July of last year, an increased rainfall is found over the Cape Peninsula, South-West, West Coast, Kaffraria and at Durban (Natal) but a decrease elsewhere. The increase was greatest (1·63 in.) over the Cape Peninsula and least (0·13 in.) over the West Coast division. As a result of the continued drought of the last two months, coupled with the occasional severe frosts, the veld and crops are reported to be in a bad way, particularly in the districts of Stutterheim, Xalanga and Sterkstroom. From what has been already stated, it is to be expected that the monthly totals should be small at the majority of the stations; thus of 335 stations, 111 had *Nil*, and 110 had a rainfall of 0·01 to 0·50 in. for the month, making 66 per cent. suffering from "absolute" or "partial"

drought. Of the remainder, 32 had 0·51—1·00 in.; 34 had 1·01—2 ins.; 23 had 2·01—3 ins.; 10 had 3·01—4 ins. Of the 15 stations having more than 4 inches, twelve (12) were situated in the Cape Peninsula, two (2) in the South-West and one (1) in the West Coast division; six (6) having 4·01—6 ins.; four (4) 6·01—8 ins.; two (2) 8·01—9 ins.; the three largest being, 10·44 ins. at Kenilworth, 10·79 ins. at Newlands and 11·70 ins. at Bishopscourt. Similarly, the maximum amounts during 24 hours were very small, 251 or about 76 per cent. of 331 stations recording half-in-inch or less during the wettest 24 hour period. Continuing the analysis, an additional 35 stations had 0·51—1·00 in.; 31 had 1·01—2 ins.; 8 had 2·01—3 ins.; 5 had 3·01—4 ins.; the largest amount being 4·06 ins. registered at Ceres on the 27th, which wsa also the wettest period over the Cape Peninsula, where $2\frac{1}{2}$ to $3\frac{1}{2}$ ins. were of common occurrence on that date. *Thunderstorms* were reported from 17 stations on 8 days of the month, 15th to 18th, and 26th to 29th, but mostly on the 17th and 27th. *Hail* was noted at 3 stations on two days, 5th and 27th. *Snow* fell at 12 stations on 5 days, chiefly in the east and south from 4th to 6th, and in the west on 27th and 28th; and *Sleet* at 15 stations on 9 days, 4th to 7th, 16th to 18th and 27th to 28th; as in the case of Snow, this phenomenon was of most common occurrence on the 5th and 6th, the ground being white with Snow at Buffel's Nek on the 5th.

Temperature, Cloud and Winds.—The mean monthly temperature of all stations was 54·4°, being 1·7° lower than during the previous month, but 0·8 warmer than during the corresponding month of last year. The mean maximum of 65·7° is 1·8° and the mean minimum of 42·3° is 1·7° lower than the corresponding values for June of this year, but 1·4° and 0·2° higher respectively than those for July, 1908. Compared with the normals, the mean temperature for the month was 0·3° less than usual, the mean maximum being 0·1° and the mean minimum 0·5° less than the average values. The mean temperature for the month at the individual stations was mostly below the average by amounts varying from 2·6° at Uitenhage and Heidelberg to 0·1° at Cape Agulhas; but was above the normal at a fair proportion of stations, the excess being greatest, 2·4°, at the Royal Observatory and least, 0·2°, at Dunbrody and Rietfontein (Div. Aliwal North). Generally speaking, those stations with a subnormal mean temperature are situated at or near the coasts and those with a higher temperature than usual at inland and more easterly positions. The day temperatures were above the average at about half the stations, the excess ranging from 5·1° at the Royal Observatory to 0·1° at East London; whilst the deficits varied from 2·7° at Uitenhage to 0·1° at Mossel Bay. The proportion of stations at which the night temperatures were lower than usual was greater than those with subnormal mean minimum temperatures; the deficits varying from 3·5° at Hanover to 0·2° at Lovedale, Umtata, and the Royal Observatory; whereas the excesses ranged from 3·1° at Main to 0·1° at Simonstown, Cape St. Francis, etc. The mean daily range amounted to 23·4° or 1·4° less than usual. The mean warmest station was Port St. John's with a temperature of 62·6° and the mean coldest, Hanover, with 41·1°, a difference of 21·5°. The highest mean maximum, 74·3° is found at Chiselhurst (near East London) and the lowest mean minimum, 22·7°, at Hanover. The highest readings of the thermometer at individual stations were recorded on 16 days, particularly on the 21st and during a warm spell from the 8th to the 11th; the lowest readings were registered also on 16 mornings, mostly from 5th to 7th and 28th to 31st. The mean value of the extreme maxima was 78·2°, which is only 0·4° lower than last month, but 1·1° higher than July of the previous year. The mean of the extreme minima (32·7°) is 2·7° lower than the preceding month, and 0·1° below the corresponding value for 1908. There was thus a mean monthly range of 45·5°. The highest day temperature recorded was 89·0° at Port Nolloth on the 21st and the lowest night reading, 12·0°, at Hanover on the 30th. There was therefore an extreme monthly range of 77·0° over all stations. *Frosts* were much more wide-spread and of greater severity than during the preceding month or during July of 1908; there being 396 instances of this phenomenon noted on the 31 days of the month, more particularly on the 1st, 6th to 8th, and 29th to 31st. The most intense frosts were apparently those of the last three days of the month when temperatures of 22° to 15° F. were of fairly common occurrence, the lowest reading noted being 10° F. at Seteba on the 28th. These frosts appear to have caused considerable damage to veld and crops, more especially in the North and East; whilst at Groot Drakenstein, Mr. Baker reports that the temperature fell below Freezing point (to 31·2° F.) for the first time in $10\frac{1}{2}$ years on the 6th of July, considerable damage being caused to tender plants in the garden which had never before suffered, whilst the Cape Gooseberry crop was ruined. At Retreat in the Cape Peninsula the grass minimum thermometer fell below Freezing-point on 8 occasions, 5th, 6th, 8th, 10th, 13th, 20th, 21st and 23rd; the mean temperature over grass was 39·0°, or 1·5° less than in June, ranging from 53·4° on the 27th to 26·3° on the 20th, when hoar-frost and ice lay on exposed bodies.

Taken as a whole the season seems unusually far advanced all over the country, as noted by various observers; *e.g.*, at Vruchtbaar (Wellington), "the buds of early fruit trees were beginning to swell"; at Kokstad, "all trees are advanced, some

peaches and almonds being in full bloom"; at Carnarvon Farm, "the spring in midwinter is quite unheard of for its prematurity, willow trees are now in blossom and even covered with open green buds on 16th July, and are to-day (1st August) as green as they are other years by the 20th." In fact, vegetation seems to be about three weeks further advanced than usual.

The mean proportion of *Clouded Sky* was only 31 per cent., being 6 per cent. less than the previous month, and 10 per cent. less than in July of last year. The skies were most obscured in the South-West, where the mean was about 45 per cent., but the amount of cloud decreased rapidly eastwards, averaging 29 per cent. along the South Coast, 21 per cent. in the South East but increasing to 31 per cent. over Kaffraria. Inland it was mostly between 20 and 25 per cent. At the individual stations, it varied between 56 per cent. at Cape Point and 13 per cent. at Mochudi. *Fogs* and *Mists* were of comparatively rare occurrence, only 62 instances being noted on 24 days, chiefly from 16th to 18th.

The prevaling *Wind Direction* was N.W. to W. over the greater part of the country, the only exceptional areas being the West Coast, where it was E'ly at Port Nolloth, the Cape Peninsula and South-West, where it was Southerly, Kimberley and Umtata, where it was S.W.'ly, and Teyateyaneng, where it was E.'ly. The mean *Force* on the Beaufort Scale was 1·99, corresponding to a velocity of 12·95 miles per hour, or 0·35 mile per hour more than in June, and 1·76 mile per hour more than in July of the previous year. The mean force was greatest over the South and West Coasts and least over the Northern Karoo. An examination of the Royal Observatory records shows, curiously enough, an unusual prevalence of Southerly winds and calms, together with a slight excess of those from N., W.S.W. and S.S.E.; on the other hand there was a marked deficiency of those between N.N.W. and W.N.W., as well as from S.E. and an entire absence of N.N.E.'ly, S.S.W.'ly, and S.W.'ly breezes. The mean wind velocity in the morning there was 8·65 miles per hour or 2·85 miles per hour less than usual, calms being in excess of the normal by about 21 per cent. Strong winds, attaining the force of a *Gale*, were reported from 42 stations on 14 days. These were most numerously noted on the 27th but were also reported on 2nd to 4th, 6th, 9th, 11th, 13th and 24th to 30th. *Hot Berg Winds* were reported on 15 occasions on 8 days of the month. A *Duststorm* occurred at Kimberley on the 24th. Lice trouble amongst cattle and several outbreaks of scab in sheep are reported from Maclear district; while influenza and measles were prevalent at Stutterheim.

OBSERVERS' NOTES.

THE OAKS (Ceres).—The heavy snow storm on the 27th and 28th was the salvation of the crops.

VRUCHTBAAR (Wellington).—Up till the rains of the 26th and 27th we had an exceptionally dry month. Warm days with cold nights. The buds of early fruit trees were beginning to swell.

UITENHAGE PARK.—Another dry and variable month, eight hot winds and about the same number of white frosts.

MUCH PUTFONTEIN (Aberdeen). Getting dry but still lots of food in the veld from the long May rains.

THEEFONTEIN (Hanover).—Light North and North Westerly winds prevailed. Fog on 16th and 17th. Frequent frosts very sharp towards end of month. Glass down to 19° on 30th.

VARKEN'S KOP (Middelburg).—Strong Northerly winds have been constant throughout the month. Hard frosts towards end of month.

GLENCAIRN (Cathcart).—Month marked by very little frost, but high winds from North-West.

HUXLEY (Stutterheim).— Very dry and high winds. Veld very dry and live stock losing their condition fast. Very severe frosts.

CLIFTON (Sterkstroom).—Stock in good condition. Crops suffering from drought.

MIDDLECOURT (Wodehouse).—There has been no rain this month, being the second month nothing registered. Weather very changeable—some fine days, others very windy. Some very sharp frosts.

VENTERSTAD.— Hard frosts during month.

KOKSTAD.—Very cold weather with severe frosts the last week of the month. Country dry and parched.

SLAATE (Xalanga).—Several sharp frosts this month, registering up to 12 degrees in the verandah. Crops more or less nipped and pasturage, which was good for time of year, dried up.

TENT KOP (Maclear).—Weather very severe during the last week of the month, but stock generally in good condition. Lice trouble amongst cattle. Several outbreaks of scab in sheep.

STUTTERHEIM.—Rain badly needed. Veld and crops in a very bad way. Influenza and measles prevalent.

UMTATA.—Strong North-West winds prevalent. Country exceedingly dry and rain is much needed. The mealie crops are not very good.

KOKSTAD (The Willows).—A comparatively mild month. No severe frosts until the 29th. Some snow fell in the district on the 6th and hills were covered. All trees are advanced; some peaches and almonds being in full bloom.

GROOT DRAKENSTEIN.—Mean temperature 1·3° below the average for 10 years (M. 0·5°, m. 2·1°), the nights being particularly cold. Rainfall only 64 per cent. of average. The weather again continued very dry this month up to the 27th, when the first real winter rain fell, not before it was needed. On the 6th the temperature fell below freezing point (31·2°) for the first time since observations have been taken here (10½ years). Considerable damage was done to tender plants in the garden, which had never before suffered. The Cape Gooseberry crop was ruined.

CARNARVON FARM.—This has been one of the most intolerable Julys on record and it is the first time during the last twenty years that we have had to record June and July as absolutely dry, not one point of moisture recorded since the 29th May, when 18 points were recorded. It will be noted from the attached table that since 1904 we have only had a total of 12 points of snow, sleet and rain, though the average since 1901 is 14. The last half of the month has been one of almost incessant wind and considerably above the average, while 26 frosts were only equalled on one occasion—1901—and 7 cloudless days is somewhat below the average. Large tracts of dry lands under cereals are getting in a bad way. High winds, incessant frosts and over two months unbroken drought are telling unmistakably, though water is fairly plentiful. The spring in midwinter is also quite unheard of for its prematurity. Willow trees are now in blossom and even covered with open green buds on 16th July, and are to day, 1st August, as green as they are other years by the 20th. Stock of all kinds still in good condition.

Year.	Rain	Wind	Frost.	No Clouds.
1901	0·37	16	26	5
1902	0·49	15	22	12
1903	0·18	16	23	6
1904	0·00	13	24	9
1905	0·00	16	24	5
1906	0·01	8	15	13
1907	0·13	10	23	10
1908	0·08	18	21	1
1909	0·00	17	26	7
Means	0·14	14	23	7

Stations.		Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory	...	67·5	47·0	57·2	79·2	21	36·1	6
Cape Town (S.A.C.)	...	64·5	48·8	56·6	81·2	21	41·5	28
Do. (City Hospital)	..	63·2	48·6	55·9	78·0	21	42·9	7
Table Mountain (Devil's Peak)		57·8	45·0	51·4	76·0	21	37·0	28
Wynberg	...	63·1	46·5	54·8	78·5	21	39·0	5
Groot Constantia	...	62·4	47·0	54·7	79·0	21	40·0	4
Bishopscourt	...	62·8	44·1	53·4	80·0	21	39·0	5
Blaauwberg	...	63·0	47·0	55·0	83·0	21	41·0	6
Retreat	...	64·7	44·6	54·6	73·4	8	33·7	20
Simon's Town	...	63·0	51·9	57·4	70·5	8	41·0	5
Groot Drakenstein	...	63·9	41·3	52·6	78·4	21	31·2	6
Robertson Plantation	...	66·4	37·9	52·2	79·0	21	35·0	5
Danger Point	...	61·2	49·3	55·2	69·0	8	42·0	21
Elsenberg (Agri. College)	...	62·3	45·2	53·8	76·9	21	36·9	6
Port Nolloth	...	62·8	42·6	52·7	89·0	21	35·5	31
O'okiep	...	65·4	42·0	53·7	76·1	10	32·6	12
Cape Agulhas	...	61·9	49·5	55·7	67·0	3, 8 & 11	42·0	5
Dunbrody	...	73·0	40·0	56·5	87·2	11	27·7	6
Heidelberg	...	67·3	36·3	51·8	79·0	21	30·0	1
Storm's River	...	65·7	44·3	55·0	82·0	11 & 14	37·0	6
George (Plantation)	...	65·5	44·4	54·9	77·0	21	39·0	6 & 7
Mossel Bay	...	66·2	47·1	56·6	78·0	3	43·0	5, 8 & 10
Cape St. Francis	...	65·9	50·3	58·1	85·0	11 & 15	40·0	6
Port Elizabeth	...	66·9	48.2	57·6	85·0	11	42·0	6
Uitenhage	..	70·8	38·9	54·8	84·3	11	29·5	1
Van Staaden's	...	67·7	43·8	55·8	82·0	12	37·0	6
Concordia (Knysna)	...	65·7	48·2	57·0	79·6	21	40·0	5
Amalienstein	.	67·6	35·6	51·6	81·0	14	25·0	1
Hanover	...	59·3	22·9	41·1	65·0	1, 3 26 & 30	12·0	30
Murraysburg	...	61·2	30·6	45·9	71·0	10	15·0	6
Kimberley	...	67·6	35·9	51·8	74·2	10	25·1	30
Bedford	...	66·6	41·8	54·2	79·0	11	28·0	6 & 31
Stutterheim	...	67·7	43·7	55·7	79·0	10	28·4	7
Sydney's Hope	...	66·1	44·3	55·2	78·5	11	19·0	29
East London (West)	...	70·4	48·4	59·4	86·0	10	40·0	6
Lovedale	...	68·8	39·1	54·0	81·0	11	28·0	31
Evelyn Valley	...	62·2	42·3	52·2	73·0	23	30·0	6 & 7
Chiselhurst	...	74·3	45·7	60·0	86·0	9	38·0	5 & 6
Aliwal North	...	65·0	29·8	47·4	72·0	10	15·0	30
Rietfontein (Aliwal N.)	...	58·3	31·2	44·8	78·0	11	19·0	30
Port St. John's	...	73·3	51·9	62·6	84·0	4	45·0	28
Tabankulu	...	67·0	41·1	54·0	65·5	27	30·7	30
Main	...	67·0	43·6	55·3	78·0	11	30·2	7
Umtata	...	72·0	37·2	54·6	84·0	27	24·0	30
Kokstad	...	64·3	33·0	48·6	74·2	27	20·1	30
Teyateyaneng	...	60·8	32·6	46·7	69·0	27	23·0	29
Mochudi (Station)	...	74·0	37·7	55·8	82·0	26	27·0	17
Hope Fountain	...	69·4	44·4	56·9	78·2	28	36·2	16
Means	...	65·7	42·3	54·0	78·2	...	32·7	
Extremes	...	...	...	...	89·0	21	12·0	30

RAINFALL, JULY, 1909.

I. CAPE PENINSULA :

	Ins.
Royal Observatory (a) 12in. gauge	2·44
Cape Town, Fire Station	2·94
Do. South African College	3·87
Do. Signal Hill	1·55
Do. Hospital	2·41
Sea Point, The Hall	2·62
Camp's Bay	3·51
Devil's Peak, Blockhouse ...	5·96
Do. Nursery	4·99
Woodstock (The Hall)... .. .	3·05
Do. (Municipal Quarry) .	3·73
Do. (Do. Nipher's Shield)	4·47
Newlands, Montebello	10·79
Bishopscourt	11·70
Kenilworth	10·44
Wynberg, St. Mary's	8·97
Groot Constantia	7·92
Tokai Plantation	6·82
Plumstead, Culmwood	8·17
Muizenberg (St. Res.)	6·59
Simon's Town, Wood ..	3·97
Cape Point...	1·03
Blaauwberg Strand	1·62
Robben Island	1·67
Maitland Cemetery	3·09
Tamboers Kloof	3·39
Retreat	5·79

II. SOUTH-WEST :

	Ins.
Eerste River	2·49
Klapmuts	2·35
Stellenbosch, Gaol	2·29
Somerset West	2·46
Paarl	3·14
Wellington, Gaol	1·99
Groot Drakenstein, Weltevreden	2·85
Tulbagh	1·74
Kluitjes Kraal	2·13
Ceres	6·64
The Oaks	2·30
Rawsonville	2·88
Caledon	1·78
Worcester, Gaol	0·88
Hex River	1·55
Karnmelks River	2·44
Lady Grey, Div. Robertson ...	0·40
Robertson, Gaol	0·63
Do. Govt. Plantation ...	0·64
Montagu	0·75
Danger Point	2·03
Elgin Plantation	4·58
Elsenberg Agricultural College...	2·21
Roskeen	2·12
Vruchtbaar	2·41

III. WEST COAST :

	Ins.
Port Nolloth (Lieut. Barber) ...	0·08
Anenous	0·41
Klipfontein	0·38
Kraaifontein	0·33
O'okiep	0·30
Garies	0·61
Lilyfontein	0·29
Van Rhyn's Dorp	1·43
Clanwilliam, Gaol	0·17

III. WEST COAST (continued) :

	Ins.
Dassen Island	1·76
Kersefontein	0·77
The Towers	1·67
Malmesbury	1·29
Piquetberg...	1·90
Wupperthal	1·48
Welbedacht ...	1·61
Hopefield	0·82
Algeria (Clanwilliam)	2·79
Cedarberg (do.) ..	4·61

IV. SOUTH COAST :

	Ins.
Cape Agulhas	1·70
Bredasdorp...	1·73
Swellendam	1·26
Groo vaders Bosch	1·35
Heidelberg...	0·76
Riversdale	1·10
Mossel Bay...	0·75
Gr at Brak River... . . .	0·61
George	1·15
Do. (Plantation)	1·02
Woodifield (George) .. .	1·18
Sour Flats	1·52
Concordia	2·10
Knysna	0·79
Buffel's Nek	2·06
Plettenberg Bay	1·65
Harkerville	2·98
Blaauwkrantz	2·09
Lottering	2·56
Storms River	1·66
Witte Els Bosch	3·50
Humansdorp	2·18
Cape St. Francis	3·66
Van Staden's, Intake	0·70
Do. On Hill	0·68
Kruis River	0·27
Uitenhage (Gaol)...	0·23
Do. (Park)	0·24
Do. (Inggs)	0·24
Armadale (Blue Cliff)	0·52
Dunbrody	0·43
Port Elizabeth (Harbour) ...	1·43
Do. (Victoria Park)	1·67
Shark's River (Nursery)... ...	1·89
Centlivres	0·30

V. SOUTHERN KAROO

	Ins.
Ladismith ...	0·30
Amalienstein	0·54
Oudtshoorn	0·00
Vlaakte Plaats	0·09
Uniondale ..	0·40
Kleinpoort...	0·30

VI. WEST-CENTRAL KAROO

	Ins.
Fraserburg Road	0·00
Prince Albert	0·00
Zwartberg Pass	0·10
Beaufort West, Gaol	0.00

VI. WEST-CENTRAL KAROO: *contd.*

	INS
Dunedin	0·00
Nel's Poort...	0·07
Krom River	0·00
Roos Plaats	0·00
Willowmore	0·28
Rietfontein	0·20

VII. EAST-CENTRAL KAROO.

Aberdeen, Gaol	0·00
Aberdeen Road	0·18
Klipplaat ...	0·27
Kendrew, Holmes	0·00
Do.	0·00
Graaff-Reinet, Gaol	0·00
Do. (Eng Yard)	0·00
Glen Harry	0·00
Wellwood ...	0·00
Bloemhof ...	0·00
Jansenville...	0·20
Roode Hoogte	0·00
Toegedacht	0·00
Klipfontein	0·00
Pearston ...	0·00
Middlewater	0·00
Somerset East, Gaol	0·13
Spitzkop (Graaff-Reinet)	0·00
Grobbelaar's Kraal ...	0·06
Muchputfontein ...	0·00
Zeekoe River	0·00

VIII. NORTHERN KAROO:

Calvinia	0·55
Sutherland	0·47
Fraserburg...	0·00
Carnarvon ...	0·00
Brakfontein	0·00
Victoria West	0·00
Britstown ...	0·00
Wildebeestkooij	0·00
Murraysburg	0·00
Richmond ...	0·05
Hanover ...	0·02
Philipstown	0·00
Petrusville...	0·00
The Willows, Middelburg	0·00
Jackalsfontein	0·00
Ezelpoort ...	0·00
Plaatberg ...	0·00
Grape Vale..	0·00
Ezelfontein...	0·00
Roodepoort...	0·00
Groenkloof	0·00
Vlakfontein	0·00
Vogelsfontein	0·00
Plaatfontein	0·00
Colesberg ...	0·00
Tafelberg Hall	0·00
Fish River ...	0·00
Varkens Kop	0·00
Droogefontein	0·00
Cradock (Gaol)	0·00
Witmoss ...	0·19
Maraisburg	0·00
Steynsburg (Gaol)	0·01
Tarkastad ...	0·01
Do. (Dis. Engineer)	0·00
Drummond Park ...	0·00
Waverley ...	0·05

VIII. NORTHERN KAROO (*con.*):

	INS.
Rietfontein (Hanover)	0·00
[illegible]	0·03
Vosburg ...	0·00
Zwavelfontein	0·00
Thebus Waters	0·00

IX. NORTHERN BORDER:

Kenhardt ...	0·00
Upington ...	0·00
Trooilapspan	0·00
Van Wijk's Vlei ...	0·03
Prieska ...	0·00
New Year's Kraal...	0·00
Dunmurry ...	0·00
Griquatown	0·00
Douglas ...	0·00
Hope Town	0·00
Newlands, Barkly West ...	0·00
Kimberley Gaol) ...	0·00
Do. Stephens	0·00
Strydenburg	0·00
Rietfontein (Gordonia) ...	0·00
Douglas (Vos)	0·00
Mazelfontein, Herbert	0·00
Rocklands, Barkly West ..	0·00

X. SOUTH EAST:

Melrose, Div. Bedford	0·32
Dagga Boer	0·17
Alicedale ...	0·32
Fairholt ...	0·00
Bedford (Gaol)	0·60
Sydney's Hope	0·23
Adelaide ...	0·27
Atherstone...	0·18
Alexandria...	0·34
Fort Fordyce	0·28
Graham's Town (Gaol) ...	0·11
Heatherton Towers	0·21
Sunnyside ..	0·08
Fort Beaufort	0·06
Katberg ...	0·20
Seymour ...	0·11
Glencairn ...	0·00
Lovedale ...	0·27
Port Alfred	0·41
Hogsback ...	0·54
Peddie ...	0·45
Keiskamma Hoek ...	0·18
Cathcart (Gaol) ...	0·03
Do. (Forman)	0·08
Do. (Station)	0·00
Thaba N'doda	0·00
Evelyn Valley	0·45
Crawley ..	0·00
Thomas River	0·00
Perie Forest	0·33
Isidenge ...	0·24
Kologha ...	0·37
King William's Town (Gaol) ...	0·00
Stutterheim, Bousfield ...	0·28
Fort Cunynghame	0·15
Dohne ...	0·00
Kubusie ...	0·37
Quacu	0·20
Blaney ..	0·00
Berlin ...	0·00
Bolo ...	0·07
Fort Jackson	0·00

X. SOUTH EAST (*continued*)

	INS.
Komgha (Gaol)	0·18
Chiselhurst	0·08
East London West	0·10
East London East	0·11
Cata	0·30
Wolf Ridge	0·45
Dontsah	0·32
Mount Coke	0·10
Blackwoods	0·03
Albert Vale, near Bedford	0·38
Huxley Farm, Stutterheim	0·02
Amabele Junction	0·25
Izileni, King Wms. Town	0·10

XI. NORTH-EAST:

	INS.
Venterstad	0·00
Mooifontein	0·00
Burghersdorp (Gaol)	0·00
Molteno	0·01
Thibet Park	0.00
Sterkstroom (Station)	0·00
Do. (Gaol)	0·00
Rocklands	0·00
Aliwal North (Gaol)	0·05
Do. Do. (Dist. Engineer)	0·10
Carnarvon Farm	0·00
Halseton	0·00
Jamestown	0·00
Whittlesea	0·00
Queenstown (Gaol)	0·00
Rietfontein, Aliwal North	0·14
Middlecourt	0·00
Dordrecht	0·04
Tylden	0·00
Herschel	0·15
Lady Grey	0·14
Lauriston	0·18
Lady Frere	0·00
Contest (Near Bolotwa)	0·00
Keilands	0·00
Barkly East	0·29
Cliftonvale	0·00
Hughenden	0·03
Indwe (Dist. Eng'rs Office)	0·00
Bensonvale Inst., Herschel	0·00
Royal, Div. Albert	0·12
Indwe (Collieries)	0·06
Stormberg Junction	0·00
Hopewell (Imvani)	0·00
Sunnymeade, Div. Albert	0·00
Clifton, Sterkstroom	0·00

XII. KAFFRARIA.

	INS.
Slaate, Xalanga	0·57
Cofimvaba	0·09
Tsomo	0·04

XII. KAFFRARIA (*contd.*)

	INS.
N'qamakwe	0·18
Main	0·00
Engcobo	0·23
Butterworth	0·09
Kentani	0·20
Maclear	1·08
Idutywa	0·00
Bazeya	1·00
Willowvale	0·26
Mount Fletcher	0·45
Somerville, Tsolo	0·89
Elliotdale	0·05
Umtata	0·31
Cwebe	0·97
Tabankulu	0·60
Kokstad	0·50
Do., The Willows	0·51
Seteba	0·30
Flagstaff	1·12
Insikeni	0·60
Port St. John's	1·17
Umzimkulu	0·54
Maclear, Station	1·06
Tabankulu (Atkins)	0·78
Umzimkulu (Strachan)	0·61
Elliot	0·32
Tent Kop (Elands Height)	0·65
Elton Grange (Mount Currie)	0·23
Ugie	0·66

XIII. BASUTOLAND:

	INS.
Maseru	0·00
Moyeni Quthing	0·00
Teyateyaneng, Berea	0·03
Qacha's Nek	0·15

XIV. NATAL:

	INS.
Durban, Observatory	1·81

XV. BECHUANALAND:

	INS.
Taungs	0·00
Vryburg	0·00
Setlagoli	0·00
Kuruman	0·00
Zwartlaagte	0·00
Nottinghame	0·00
Armadillo Creek	0·00
Mochudi	0·00

XVI. RHODESIA:

	INS.
Hopefountain	0·04
Rhodes Matoppo Park	0·00

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The following Table of Current Market Rates (Wholesale) of Agricultural Produce on Saturday, the 21st August, 1909, ruling at the several centres named, is published for general information.

Centre.	A.	B.	C.	D.	E.	F.	G.	H.	J	K.	L.	M.	N.	O.	P.	Q.	R.
	Wheat	Wheat Flour	Boer Meal	Mealies	Mealie Meal	Barley	Oats	Oat-hay	Lucerne Hay.	Potatoes	Tobacco (Boer Roll)	Beef	Mutton	Fresh Butter	Eggs	Cattle (Slaughter)	Sheep (Slaughter)
	per 100 lbs.	per 100 lbs.	per 100 lbs.	per 100 lbs.	per 100 lbs.	per 100 lbs.	per 100 lbs.	per 100 lbs.	per 100 lbs.	per 100 lbs.	per lb.	per lb.	per lb	per lb.	per doz		
	£ s. d	£ s d.	£ s. d	£ s. d.	£ s. d.	£ s. d	£ s. d.	£ s. d	£ s. d	£ s. d	£ s. d	£ s. d.	£ s. d	£ s. d	£ s d		
Aliwal North..	0 12 6	1 1 6	0 13 9	0 5 6	0 7 6	0 8 6	0 10 0	0 6 0	0 3 0	0 10 0	0 1 0	0 0 6	0 0 4	0 1 6	0 1 3	£10 10s.	15/-
Beaufort West	0 15 0	0 19 0	0 14 6	0 7 0	0 8 0	0 10 0	0 7 6	0 6 0	0 5 6	0 14 0	0 0 8	2d. to 4d.	2d. to 4d.	0 1 6	0 1 3	£10	13/-
Burghersdorp	0 13 6	0 18 6	0 16 3	0 6 0	0 7 9	0 6 3	0 10 0	0 6 9	..	0 8 6	..	0 0 8	0 0 4	0 1 4	0 0 11	£11	14 6
Cape Town ..	..	..	..	..	..	0 6 4	0 5 8	0 4 5	0 6 0	0 9 8	..	..	..	0 1 3	0 1 0	..	..
Clanwilliam ..	0 12 9	..	0 13 9	0 7 6	0 8 0	..	0 6 6	0 5 6	..	0 7 0	0 0 0	0 0 6	0 0 7	0 1 3	0 0 9	..	..
Colesberg ..	0 10 0	..	..	0 6 3	..	0 6 6	..	0 5 6	..	0 16 0	..	0 0 3½	0 0 4	0 1 6	0 1 0	..	..
Cradock ..	0 14 0	..	0 15 0	0 6 9	..	0 6 6	0 8 0	0 5 0	0 4 0	0 9 0	0 0 7	0 6 4	0 0 4	0 1 3	0 1 0	..	..
Dordrecht ..	0 11 6	0 19 0	0 16 6	0 6 0	0 8 0	0 5 0	0 9 0	0 5 6	0 6 0	0 12 6	0 1 0	0 0 3	0 0 3¼	0 1 4	0 0 7	£10	12/6
East London ..	0 10 9	0 18 0	0 15 9	0 6 0	0 14 0	0 6 6	0 6 6	0 4 0	0 5 0	0 9 0	0 1 0	0 0 4	0 0 4	0 2 0	0 0 11	£10	19/-
Graaff-Reinet	0 13 9	..	0 14 6	0 6 3	..	0 9 0	..	0 5 6	0 3 6	0 11 6	..	0 0 3	0 0 4	0 1 10	0 0 10½	£8 5s.	22/-
Grahamstown	0 11 1	..	..	0 6 9	..	0 6 6	0 6 9	0 5 0	..	0 12 9	0 0 5	0 0 5	0 0 5	0 2 0	0 1 1¼	..	..
Kimberley ..	0 12 3	0 17 3	0 15 6	0 4 0	0 6 9	0 7 4	0 6 10	0 5 6	0 4 10	0 11 0	0 0 5½	0 0 8	0 0 5	0 1 1	0 0 9	£7 15s.	11/3
King William's Town ..	0 10 0	0 18 0	0 15 0	0 5 6	0 6 6	0 5 0	0 6 0	0 4 3	..	0 10 0	0 0 4	0 0 4	0 0 4	0 1 6	0 1 0	£12	18/3
Malmesbury ..	0 11 0	0 14 6	0 12 6	0 8 0	..	..	0 5 0	0 3 9	..	0 10 0	0 1 0	0 0 6	0 0 5	0 1 6	0 1 0	£10	16/-
Mossel Bay ..	0 13 0	0 18 6	0 16 0	0 6 9	..	0 6 0	..	0 4 0	..	0 10 0	0 0 4	0 0 5	..	..	0 0 7	..	..
Port Alfred ..	0 13 0	1 0 0	0 18 0	0 [illegible] 0	0 11 0	0 7 6	0 11 0	0 5 0	..	0 12 0	0 0 6	0 0 5	0 0 5	0 2 0	0 0 6	£12	15/-
Port Elizabeth	0 11 0	..	..	0 6 3	..	0 5 0	0 6 0	0 5 0	..	0 18 0	..	0 0 6	0 0 6	0 2 1	0 1 0	..	..
Queenstown ..	..	0 17 0	0 14 6	0 5 0	0 8 0	0 8 3	0 9 0	0 5 6	0 4 3	0 8 6	0 0 4	0 0 4	0 0 4	0 1 9	0 1 0	..	..
Tarkastad ..	0 11 9	1 1 0	0 15 0	0 7 9	0 12 0	0 7 0	0 6 0	0 4 6	0 3 6	0 8 0	0 1 0	0 0 4	0 0 4	0 1 3	0 1 0	£7	15/-
Vryburg ..	0 15 0	1 0 0	0 12 6	0 4 6	0 6 6	0 11 0	0 10 0	0 3 0	0 5 6	0 13 0	0 0 4	0 0 8	5d. to 7d.	0 1 6	0 0 9	£7 to £8	10/- to 12/-
Worcester ..	0 10 6	0 16 0	0 12 9	0 6 6	0 7 6	0 7 0	0 5 8	0 4 0	0 4 6	0 8 8	0 0 5	3d. to 7d.	0 0 4½	0 1 4	0 1 0	£6 to £8	12/6 to 15/-

FREE GIFTS!
HANDSOME PRESENTS!

Write TO-DAY for Mendelsohn's Handsome ILLUSTRATED CATALOGUE (B 22) containing full particulars of their Great Free Bonus Scheme, by which everyone who sends "Cash with Order" receives a

"HANDSOME FREE GIFT."

18-ct. Gold, set 5 Diamonds, **£7 10s.**, other prices, **£5, £10, £15, £20.**

18-ct. Gold, set 5 Fine Diamonds, **£11 10s.**

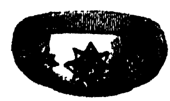
18 ct. Gold, set Beautiful Diamond, **£15, £20, £30, £40.**

9-ct. Gold Brooch, **9/6**

MENDELSOHN'S

Help You to SAVE MONEY by supplying you with SINGLE ARTICLES AT WHOLESALE PRICES.

18-ct. Gold, set Diamond and Gem, **£3 10s.**, 2 Diamonds, **£5 5s.**



18 ct. Gold, set 2 Diamonds and 1 Gem, **50/-** Various others, **25/- 30/- 40/-**

18-ct. Gold, set 1 Fine Diamond, **37/6**

PRODUCE MARKETS.

CAPE TOWN.

The Produce Department of the firm of R. Muller, Cape Town, reports for the month of August, as follows, viz :–

Ostrich Feathers.– The next London Sales open on the 11th October, the quantity to be offered is large and represents something over £350,000. Our local Market is firm for all fair to good quality, while Best Whites and Feminas may be quoted 5 per cent. higher.

	£	s.	d.	£	s.	d.
Super Primes ...	15	0	0	35	0	0
First, ordinary to Super	12	0	0	17	10	0
Seconds	7	10	0	9	10	0
Thirds...	3	0	0	5	10	0
Femina Super ...	10	10	0	17	0	0
Do., Seconds to Firsts	4	10	0	10	10	0
Byocks (Fancy) ...	5	10	0	9	10	0
Long Blacks	3	10	0	7	0	0
Medium Blacks ..	1	10	0	3	10	0
Short to Medium ...	0	10	0	1	5	0

	£	s.	d.	£	s.	d.
Floss	0	5	0	2	0	0
Long Drabs	2	5	0	4	0	0
Medium Drabs ...	0	15	0	1	10	0
Short to Medium ...	0	5	0	0	15	0
Floss	0	5	0	2	0	0
White Tails	1	5	0	2	10	0
Coloured Tails ...	0	5	0	2	5	0
Chicks...	0	1	0	0	2	0
Spadonas	0	10	0	5	0	0
Inferior Black and Drabs, short to long	0	0	6	1	10	0

Wool.– Several lots of New Season's Wool have been offered and met with good competition. One lot consisting of 103 Bales Calvinia Grease was, after spirited bidding, knocked down at 6½d. per lb. The tone of the market generally seems stronger and any decent parcel finds a ready sale. I quote for Karoo from 5½d. to 7½d. Calvinia from 5d. to 6½d. Malmesbury from 4½d. tot 5½d. according to quality and condition.

	d.	d.
Super long Grass Veld	7½	8½
Do. Karoo ...	5½	7½
Medium	4	5½
Short and inferior ...	3½	4

		d.	d.
Wool for Washing	0	4½	5½
Snow-white Super to Extra	1	4	7
Do. Ordinary ...	1	1	4
Fleece Washed	0	0	9

Mohair.—The Market, during the past month, has been quiet. There is enquiry for First and Kids. Sellers, however, are holding back with a view to obtain higher prices. Super Summer First may be quoted from 12d. to 12½d. Summer Kids from 1s. 8d. to 1s. 9d.

	s.	d.	s.	d.
Firsts, Summer	0	11	1	0½
Kids	1	6	1	9
Seconds	0	5	0	7½
Winter	0	8	0	9
Do. Kids...	1	0	1	2

Hides and Skins.—A keen competition exists for all classes. Heavy Butcher Hides are specially enquired for.

	s.	d.	s.	d.
Long woolled Skins ...	0	5½	0	6
Short...	0	4	0	4½
Shorn	0	0	0	3
Bastards	0	4	0	4½
Cape Skins, each	2	2	2	8
Do., cut, each ...	0	0	1	3
Goat, heavy to light ...	0	11½	1	1½
Sundried	0	0	0	6
Angoras	0	5½	0	6
Sundried Hides	0	5½	0	7½
Salted	0	5	0	7
Wet...	0	3½	0	4½

PORT ELIZABETH.

Messrs. J. Daverin & Co. report under date August 27th. :

Ostrich Feathers.—The Market was heavily supplied this week with an assortment much above the average in quality. Competition was active, and prices for all descriptions ruled firm, except on Wednesday, when average and common sorts were weaker. Little business has been done out of hand. The total quantity sold on the market during the week amounted to £20,552 and weighed 7,777 lbs.

	£	s.	d.		£	s.	d.
Primes : Extra Super			Special Prices.				
Good to Super ...	20	0	0	to	10	0	0
Whites : Firsts ...	12	0	0	„	20	0	0
Seconds ...	4	0	0	„	10	0	0
Thirds ...	1	0	0	„	4	10	0
Feminas : Super ...	10	0	0	„	20	0	0
Firsts ...	6	10	0	„	10	10	0
Seconds ...	2	10	0	„	6	0	0
Thirds ...	0	10	0	„	2	10	0
Greys ...	1	10	0	„	7	0	0
Fancy	2	10	0	„	8	0	0
Tails : White	0	10	0	„	3	0	0
Light	0	10	0	„	2	10	0
Coloured & Dark	0	0	6	„	0	15	0

	£	s.	d.		£	s.	d.
Blacks : Long	1	15	0	to	7	10	0
Medium	1	0	0	„	4	0	0
Short	0	4	0	„	1	0	0
Wirey	0	0	3	„	0	0	6
Floss	0	5	0	„	1	7	6
Drabs : Long...	0	15	0	„	4	0	0
Medium	0	10	0	„	1	10	0
Short...	0	1	6	„	0	7	6
Wirey	0	0	3	„	0	0	6
Floss...	0	5	0	„	1	10	0
Spadonas : Light	0	5	0	„	5	0	0
Dark	0	2	6	„	2	0	0
Chicks... ...	0	0	6	„	0	15	0

The following may be quoted as the approximate current values of unsorted parcels, per line :—

	Whites.	Feminas.
Superior pluckings	£8 0 0 to £10 0 0	£5 10 0 to £7 10 0
Good Average lots	6 10 0 to 7 10 0	4 10 0 to 5 0 0
Poor Average lots	4 0 0 to 5 0 0	2 0 0 to 2 10 0
Common lots, stalky, narrow and discoloured	2 0 0 to 3 10 0	0 15 0 to 1 15 0

	Tails.	Blacks.	Drabs.	Spadonas.
	s. d. s.	s. d. s. d.	s. d. s.	s. d. s. d.
Good	15 0 to 17	20 0 to 40 0	12 6 to 15	30 0 to 40 0
Average	7 6 to 12	12 6 to 17 6	7 6 to 10	10 0 to 22 6
Poor	2 6 to 5	7 6 to 10 0	5 0 to 7	2 6 to 7 6

It will be understood that for Special Lots, these quotations may be exceeded.

Wool.—This market continues very firm, and all new season's grease is readily sold at extreme prices. On the Public Market yesterday only a very small quantity was offered, prices showing no change.

Snowwhite, Extra Superior ...	18d to 19d
Do. Superior	17d „ 17½d
Do. Good to Superior...	16d „ 16½d
Do. Inferior Faulty ...	13d „ 14d
Grease, Super Long, well-conditioned, Grassveldt grown (special clips) ...	8d „ 9½d
Do. do. do. ...	7d „ 8d
Do. do. Karoo grown (special clips)	6¾d „ 7½d
Do. do. do. ...	5½d 6¼d
Do. do. Mixed Veldt...	6d „ 6½d
Do. Light, faultless, medium Grassveldt grown ...	6d „ 7d
Do. do. Karoo grown	6d „ 6¼d
Do. do. short, do.	5¼d „ 6d
Grease, Coarse and Coloured ...	1d to 3½d
Scoured do. do. ...	2d „ 9d
Basuto Grease, short	6d „ 6½d
O.R.C. Grassveldt Grease, long & well-conditioned (special clips)	6d „ 7½d
Do. do. do. ...	5¾d „ 6½d
Do. do. medium grown, light, with little fault	5½d „
Do. do. short, faulty & wasty	4½d „ 4
Do. do. Karoo grown, long & well-conditioned ...	5¼d „ 5¾d
Do. do. medium grown, light with little fault ...	4½d „ 5d
Do. do. short, faulty and wasty...	3¾d „ 4¼d

Mohair.—This market still remains quiet, and only a limited business has been done in the open market during the week, chiefly in Summer First at 12d. The tone of the market generally is more cheerful, and we hope soon to be able to report some move.

On the Public Market on Tuesday a fair quantity was offered, prices showing some improvement as compared with the previous week's sale

Super Kids	21d to 21d	**Mixed O.R.C. Hair (average)**	8½d to 10d
Ordinary Kids and Stained ...	15d „ 18d	**Do. very mixed** ...	7d 8d
Superior Firsts, special clips ...	12½d „ 12½d	**Seconds and Grey**	5d 7½d
Ordinary Firsts...	11½d „ 12d	**Thirds**	4½d 4¾d
Short Firsts and Stained ...	10d „ 10½d	**Winter Kids, special clips** ...	14d 14½d
Superfine Long Blue O.R.C. Hair	10d „ 10½d	**Do. good ordinary** ...	13d 14d
		Winter Hair	9d 9d
		Basuto Hair	8½d 9d

Skins — Sheepskins sold this week in bundles at 5¼d and Pelts at 3¾d.; Cape, 23d.; damaged, 7d each, Goatskins, 12½d, damaged, 6d per lb, and Heavy Goatskins, 8½d.; Angoras, 6¾d, Shorn, 5¼d, damaged, 3½d per lb; Johannesburg Sheep, 5d; Goats, 9d, Angoras, 6d; Springbok, 8½d each

Hides — Sundried, 8¼d; damaged, 7¼d; Salted, 7¼d; damaged, 6¼d; Thirds, 3d.

Horns — 3½d each all round

FRUIT EXPORT.

Return of Fruit Shipped from Cape Colony during July, 1909.

Port of Shipment.	Destination.	No. of Packages.	Description of Fruit.	Quantities.	Value. £ s. d.
Cape Town ...	St Helena	5	Oranges ..	2 000	4 0 0
„ ...	„	1	Lemons	225	0 5 7
„ ...	„	3	Naartjes ..	940	1 13 0
„ ..	„	1	Pines	36	0 9 0
„ ...	England	5	Lemons	555	1 10 0
„ ...	„	2	Grape Fruits	40 lbs.	0 5 0
„ ...	„	1,790	Naartjes ..	79,826	229 10 10
„ ...	„	2 471	Oranges ...	269 224	931 5 10
„ ...	German South West Africa	224	Apples ...	80,677	71 4 0
„ ...	„	24	Bananas ..	19,030	18 19 6
„ .	„ ...	2	Guavas ...	500	0 10 0
„	„	1	Cocoa Nuts ..	36	0 4 0
„ ..	„	23	Lemons ..	5,150	9 6 0
„ .	„	41	Naartjes ..	9,590	20 9 0
„ ...	„	282	Oranges ...	40,612	108 4 0
„ ..	„ . . .	7	Pears ...	860	4 17 0
„ ..	„ ..	39	Pines ...	1,295	14 2 6
East London	England	1	Pines ...	24	0 5 0
Port Elizabeth	„ ..	5.132	Oranges ..	195,895	634 13 6
„ ...	„	98	Naartjes .	2,700	12 1 6
. .	„ .	2	Pines ...	70	0 15 0

THE

Agricultural Journal

OF THE CAPE OF GOOD HOPE.

No. 4. OCTOBER, 1909. VOL. XXXV.

Published Monthly in English and Dutch by the Department of Agriculture and distributed gratis to bona fide farmers in the Cape Colony on application through the Resident Magistrate of the District.

SUBSCRIPTION 5s. PER ANNUM. Post Free in South Africa.
Remittances to be made Payable to the Publishers CAPE TIMES, LTD., Church St., Cape Town.

Postal Address:
The Editor "Agricultural Journal," Department of Agriculture, Cape Town.
Telegraphic Address: "Bulletin," Cape Town.

CONTENTS.

NOTES.

The Free List Reopened.

The Free List for the *Agricultural Journal* is now open again for new applications, to begin with the January issue, 1910. Those who have applied recently and have not received Journals will therefore do well to send in applications afresh. All applications must reach the Department of Agriculture, Cape Town, not later than November 30th. It has to be remembered that the Free List is confined to *bona fide* farmers resident in the Cape Colony, who must forward their applications through the Resident Magistrate of the District in which they reside. At the same time applicants must give their names as distinctly as possible in order to avoid confusion with others, their *full Postal Addresses*, and state their occupations. They must also state whether the Dutch or English issue is desired. Secretaries of associations are particularly requested *not* to forward full lists of members. If any members of associations entitled as above are not receiving the journal their names, addresses and qualifications may be submitted through the Resident Magistrate.

Destruction of Locusts.

It is notified for general information that, until the funds provided by Parliament for the destruction of Locusts are exhausted, Government aid will be given towards that purpose, as specified hereunder. Full information on the subject can be obtained from Resident Magistrates. 1. Government aid will be given in respect of the following articles: (1) Spraying pumps. (2) Locust poison Mixture. (3) Water drums. 2. (*a*) Spraying pumps and Locust poison mixture and water drums can be obtained by applicants free of charge from the Resident Magistrate of their district either direct or by application to the nearest police station, but the Government does not hold itself responsible for any delay or failure to supply these materials. (*b*) Each applicant will receive one spraying pump, and such quantity of the mixture as the Resident Magistrate may consider necessary. (*c*) Receipts on the prescribed form must be given by applicants to the issuing officer for all materials supplied in terms of the preceding section. (*d*) A limited number of the water drums (holding ten gallons) will be available for sale through Resident Magistrates at the rate of 5s. each. (*e*) Resident Magistrates will be prepared to sell pumps outright to applicants, instead of issuing them on loan, at the following prices: New pumps 17s. 6d. each. Used pump in good order 10s. each. (*f*) Locust officers will be appointed in locust infected districts where necessary for the purpose of giving advice to farmers and demonstrating the spraying of swarms of Locusts with the poison mixture.

Juriesfontein Dam, Fraserburg.

Mr. W. A. B. Rowan, C.C., Fraserburg, writes:—Mr. J. F. van Wijk of Juriesfontein, Ward 2, this District, is busy with a dam across a loop, or tributary, of the Zak River. The plan, which is the result of his own intelligence and experience, is approved by Government irrigation engineer Kleyn. The dam is constructed of clay and sand, mixed and covered with two feet of Karoo gravel, and paved (straat) with stones not less than one cubic foot in size The wall is very strong, being 111 feet at the base with a 2¼ in 1 ft. slope; and the crest is covered with gravel. Catchment area 9 x 6 miles An area of about 200 morgen could be irrigated, as soon as the dam has been completed. Mr. van Wijk, although well advanced in years has all the pluck and enthusiasm of a young man, and is setting the small "Zaai" farmers a very good example. The completion of the dam is anxiously looked forward to, and an opening ceremony is hinted at. I hope that one of our ministers will be able to attend to urge our Karoo farmers to even greater deeds in this direction.

Re-Stocking of Woolled Sheep.

Mr. Rowan also states that a very good start has been made in the direction of re-stocking the district with woolled sheep by the purchase of 38 high class Rambouillet rams from the Bedford Ram fair. Messrs G. van Schalkwijk, Modderfontein, I. v. d. Merwe, Ploegfontein, L. v. d. Merwe, Vondeling, F. P. R. Theron, Celeryfontein, and J. Visagie, Gideonsfontein, are the buyers, although Mr. v. d. Merwe of Ploegfontein has been the leading spirit in the venture. They are all highly pleased with the rams selected by Messrs. Pringle and Son, of Glen Thorn, Adelaide, on their behalf, and take this opportunity of thanking the Bedford Ram Breeders Association, and Messrs. Pringle and Sons for their valuable advice and kind assistance. Mr. Rowan hopes they will get some reward by heavy purchases being made from this district at an early date.

Bathurst Export Fruit Trade.

During the sitting of the Agricultural Union in Cape Town at the close of last month we had the pleasure of meeting Mr. Stephen Smith, the Bathurst delegate. Mr. Smith brought to Cape Town some excellent samples of fruits grown in his district. Among these was a very fine Queen pine, full flavoured and well grown which was quite a revelation. The other samples included a late orange which is from Coomb's Vale. This he calls the Late Levanche. Mr. Smith informs us that there has been a great expansion in the fruit industry in his district of recent years and where this product used to be a drug in the local markets and people looked upon it as not worth bothering about, they are now laying out fresh plantations on a larger scale than ever. For this the Bathurst Farmers' Union, a co-operative concern working on sound business lines, is largely responsible. This concern started in 1907 and has been very successful in handling the export of fruit and produce and distributing it throughout the country. In 1908 253,000 citrus fruits and 520 dozen pines passed through their hands. In 1909, so far, 15,632 dozen pines and 188,700 citrus fruits have been handled. The sign of success is that where the prices previously obtained were very poor they are now satisfactory . This has all come about through careful distribution and avoiding flooding any single market.

Transkei Produce in Cape Town.

Through the courtesy and suggestions made by Colonel Levey, I.S.O., M.L.A., the Cape Town Chamber of Commerce has opened a room for the permanent exhibition of agricultural products. At the present time suitable articles have been sent from the Transkei and have been placed in the vestibule on the first floor of the Old Town House, Greenmarket Square. They consist of the following. One bag of Kaffir corn, grown by Mr. C. Gregory, Port St. John's, 1909. One bag of Hickory King maize and nine cobs, grown by Mr. C. Maytom, Port St. Johns, 1909. One bag of German Yellow maize and six cobs, grown by Messrs. Wardlaw and Kersten, Umgazi, near Port St. Johns, 1909. One bundle of Raglan's "Conqueror" and "Orinoco" tobaccos, together with sample plug tobacco manufactured from Raglan's "Conqueror" tobacco, grown and manufactured by Mr. Chas. Maytom in the Umzimvubu Valley, Port St. Johns, 1908-9. Samples of cotton grown on the banks of St Johns River, planted during August 1908 and picked in 1909. Samples of gas-producing coal, magnitite, steam and household coal, from the Transkeian Colliery, Zadungeni, near Cala. Twelve tins of ochre from the same district. These can be inspected by the public at any time during the day, and represent a most interesting exhibit of the productions of the Native Territories It is hoped that this will form the nucleus for a permanent exibition of agricultural products and minerals and the Chamber of Commerce will welcome other suitable articles from any farmers, producers or manufacturers, who would like to make merchants and others in the populous district of the Cape Peninsula acquainted with the resources of the Colony. Any communications on this subject should be addressed to the Chamber of Commerce, Cape Town.

Jansen's Prickly Pear Exterminator.

Mr. R. W. Thornton, Government Agriculturist proceeded to Graaff-Reinet in September 1908 and carried out an experiment with Jansen's Prickly Pear Extirpator. In reporting the results he stated: "Previous to leaving for Graaff-Reinet I communicated with Mr. Jansen requesting him to supply the labour and material free of charge for this experiment —as the last experiments of this sort cost the Government a considerable amount of money. Mr. Jansen complied with the request and the experiment was carried out as follows on the 8th September 1908. One quarter morgen of thickly covered prickly pear land was carefully measured and marked off and four men carried out the work which occupied just two and a half hours therefore it would take four men ten hours to do a morgen and the cost of labour at 2s. per diem for each labourer would amount to eight shillings.

"The quantity of preparations used for the quarter morgen was seven gallons in all, so for one morgen 28 gallons are required. The price as quoted to the farmers amounts to two pounds two shillings. Thus the total cost of killing one morgen including labour amounts to two pounds ten shillings (£2 10s.). On the 13th I again inspected the plot and found that the poison was already taking effect; this was just five days after the injection. On the 24th September the plot was re-inspected and most of the trees were found to be in an advanced state of decay. All trees overlooked during the first operation were now poisoned and also the centres of dense patches which could not be reached in the first operation

were now found to be accessible owing to the rotting of the trees round the edges of the clump and were also poisoned. The time occupied by this work and the poison used is included in above figures

"The scene of the experiment was revisited on the 28th April 1909 just seven months and 8 days after the experiment was started. All the trees injected were found dead into the ground and the experiment from the point of view of efficiency was an entire success.

"The strong points in favour of this poison are:—

"1st. The small quantity of material required for a given area as compared with other poisons thus reducing the cost of transport in difficult country

"2nd. The simplicity with which it can be used, which is as follows A hole is made in the side or point of the leaf with a butcher's knife and a small pebble inserted to keep the gash open, a small quantity of the fluid is then poured into the reservoir thus created and this completes the operation.

"3rd. Very few leaves drop and practically not one before they are entirely killed by the poison, so further spreading is prevented. This is one of the chief drawbacks to most of the other preparations experimented with at other times.

"4th The only implements required are a kettle and a knife

"The amount given for labour in this report should not be taken into account because if given out on contract the work could be carried out at a far cheaper rate. Shepherds could also do a great deal of eradication while tending their flocks Far more time and material were used on the experiment plot than necessary increasing the cost considerably However I did not like to interfere as Mr. Jansen had instructed his men and I merely had to note the time taken and the quantity of poison used but frequently 15 to 20 leaves were poisoned on one tree when from three to five injections would have sufficed. This was proved by the fact that outside the Experimental plots I had a number of trees poisoned making from one to five injections according to the size of the tree and the number of large branches. These trees are as entirely destroyed as those which received a far greater number of injections, also a fair quantity of the poison was wasted due to carelessness and bad kettles which wastage if prevented would further reduce the cost."

East Coast Fever.

Owing to the near approach of East Coast Fever on the Natal Border and the outbreaks of that disease in Alfred County, Natal, additional regulations were gazetted during September, proclaiming the District of Bizana as to be taken and deemed to be a suspected district and enforcing the following:—

1. It shall not be lawful to remove, or cause or allow to be removed, or permit to stray, any horned cattle from or into the said district of Bizana.

2. If any horned cattle be removed or introduced into the district of Bizana from any of the adjoining districts of the Transkeian Territories, it shall be lawful for the Headman of the location in which such cattle

may be found to take them in charge with a view to isolating them as completely as circumstances permit, and to detain them in such isolation until such time as the Resident Magistrate of the district or other officer appointed thereto by him in writing shall, after due enquiry into the circumstances of their removal, introduction or entry, issue instructions of their disposal and such cattle shall be disposed of in accordance with such instructions.

3. It shall not be lawful to introduce any transport wagons or goods into the said district of Bizana save and except through the port of entry established at Nqabeni Drift, provided that the horned cattle which have drawn such wagons or goods thither shall first have been outspanned on the Flagstaff side of the boundary, and that such horned cattle shall not themselves be introduced or utilised for the introduction of such wagons or goods into the said district.

4. It shall not be lawful for any human being, animal, article or thing, to cross the border from the district of Bizana into the Colony of Natal save and except through Middledrift, at which place human beings on foot shall be permitted to cross the border with their personal effects.

Any person contravening the provisions of the foregoing regulations, or interfering with or molesting any officer, headman or other duly authorised person in the performance of any duty imposed by the Proclamation will be liable on conviction to a fine not exceeding fifty pounds sterling (£50) or, in default of payment, to imprisonment, with or without hard labour, for any period not exceeding three months, unless such fine be sooner paid

Every police officer, headman, justice of the peace and inspector of Native locations is strictly charged to see that the Proclamation is obeyed, and to bring to justice any person who may contravene the same.

Cover for Lucerne Hay.

"When the farmer considers that a ton of well-cured alfalfa (lucerne) hay is worth about as much as a ton of wheat bran, he ought to see that it is profitable to protect it from the rain and dew. He would scarcely hesitate to provide suitable covering if he had several tons of bran in the field exposed to the elements Hay-caps will soon pay for themselves by the finer quality of the hay they assure, aside from the larger quantity of the best grade that their protection guarantees

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"The barn is the best place for alfalfa if all conditions are right. Cases of spontaneous combustion in stack and mow make farmers fearful of using the barn, especially for the first cutting, which is always most difficult to cure There are certain conditions that must be observed if this hay is to complete its curing properly and safely in the mow. The bottom of the mow should be elevated at least a foot from the ground, floored with poles or joists, and they should be about two-thirds covered with boards or other material in such a way as to provide numerous openings or air spaces of considerable size. If the mow already has a tight floor, a part of the flooring should be removed before the hay is put in. Then a box or barrel should be placed in the centre of the space and lifted up as the filling proceeds. If the mow is over thirty feet long, a second barrel should be used; that is, an air shaft should be left in about each fifteen to twenty feet. A layer of dry hay or straw sandwiched in about every four or five feet, as the mow fills, can be used to much advantage. If the mow is large enough in length and width, an excellent, safe

plan is to spread the first cutting over the entire bottom, filling up to a height of four or five feet. The second cutting may be placed over this, on top of a layer of straw, and the third cutting over this. There is virtually no danger from spontaneous combustion or from mold if this is done, and the hay will be as bright and green and almost as rich in protein in January as when harvested."—(From Coburn's "The Book of Alfalfa.")

Farm Telephones in South Africa.

The S.A. National Union has been interesting itself in the above subject, and gleaned some information which we have been requested to publish. The replies are from the Cape, Natal, and Rhodesia, the Transvaal and O.R.C. administrations having still to answer the enquiries. The Cape authorities replied:—There is no difficulty whatever in establishing farm telephone systems either for the use of a single homestead or to connect a number of farms on one line to the nearest village or railway station. The Department has already provided a number of lines for farmers, and it is always prepared to erect more to meet any set of practicable conditions that may be put before it. The ordinary rental charges are £2 per annum for each telephone and £4 per annum for each mile of line. These rates, which free the renter from the expense of maintenance, apply only in towns at which a lineman is stationed, and where existing poles can be used In outlying places this basis would not be satisfactory, and in the case of lengthy lines the charge would prove prohibitive.

The Department undertake to provide lines on the following terms.—

(1) The farmer may erect and maintain the line himself at his own expense, merely paying a nominal licence fee in formal acknowledgment of the Government's monopoly. The Department, if desired, will furnish technical advice gratis, and it will supervise the construction and carry out repairs on reimbursement of its expenses.

(2) The Department will erect the line at the farmer's expense and charge him the actual cost of subsequent maintenance, subject to the payment of the prescribed annual licence fee.

(3) The Department will erect the line at its own expense and rent it to the farmer under a 3, 5 or 10 years' agreement at an annual rate which covers all labour costs involved and interest and depreciation charges upon the cost of the line.

At the end of the agreement period a substantial reduction is made, but throughout the whole time that the line is rented, the farmer is responsible for repairs, etc. These he may attend to himself, or the Department will undertake it at his expense.

(4) The Department will advise as to the best means of utilising fencing posts as supports for telephone purposes in any practicable case that may be submitted to it.

It will be seen that it is not sought to make any profit out of this class of service. Despite this, however, owing to the high cost of construction, the annual charges are considered by many applicants to be more than the telephone would be worth to them. Telephones cost from £4 to £5 each, and the present cost per mile of a single wire supported on

20-foot poles over open veld and soft ground within 20 miles of the railway may be taken as from £50 to £60. The line costs can of course be reduced if the farmer provides the unskilled labour needed, and a further saving can be effected if suitable wooden poles are procurable in the neighbourhood at a low figure It will of course be understood that the matter has been dealt with herein purely from a commercial point of view, and that the Department has had to see that the revenue has been adequately protected against loss.

Terms in Natal.

The Natal P.M G. replied -The connecting of farms by telephone with centres of population is a subject in which I am much interested and to which I have given time and attention, and I am prepared to undertake such works in any part of the Colony provided a sufficient return to cover annual charges and interest is assured. I beg to forward herewith for your information a *resumé* of proposals made to provide such connections at Rosetta and Nottingham Road, but although I have no doubt the rates quoted were lower than would be quoted by any other South African Administration, the farmers concerned regarded the amount quoted as too high, and the negotiations fell through. It is interesting to note that in the case of Rosetta, the most distant connection is 6½ miles from the station and the occupant would be required to pay only £10 10s. per annum for the service. At Nottingham Road the most distant connection is 11 miles away, and the farmer would pay £13 per annum In Pietermaritzburg a business connection only a few yards distant from the Exchange is not installed for less than £10, the charge increasing by at least £1 for each quarter of a mile after the first two miles. A person residing five miles from the Exchange and requiring a business connection with the Exchange, would, therefore, be required to pay rent of at least £22 per annum, and the Natal telephone rates, I should point out, are the lowest in South Africa In the Transvaal a good deal is being said about telephones for farmers, but there is very little difference between their new rates and ours, as they charge 10 per cent. on the cost of extension as a yearly rental, and their construction must be more costly than ours. I fear that unless farmers can be given telephones for next to nothing, they will not take them up.

In the Rosetta scheme it was proposed to connect 10 farms with each other and with the Railway Station. The erection of 16½ miles of line was involved—of which 13 miles would have been an entirely new pole line. The work was estimated to cost £750, and it was proposed to charge a rental of £10 10s per annum for each connection. The amount, £126 per annum, includes a fee of £7 10s., payable to the Railway Department for clerks' services at the Station in attending to the subscribers' requirements. (This fee would ordinarily be £2 10s. for such services, but owing to the required connections being widely separated, it was necessary to estimate for the erection of three lines and arrange for connection to be established at the Station as required.) The inclusive return per mile works out at £7 12s. 7d. The charge was regarded by the applicants as too high.

In the Nottingham Road case it was proposed to connect seven farms with the Station, the most distant being 11 miles away. The erection of a new pole line for the whole distance was involved, and an expenditure of approximately £630. Including a fee of £2 10s. for clerks' services at

the Station, an inclusive charge of £91 per annum was quoted or a return of £8 5s. 4d. per mile. The charge, amounting to £13 per connection, was regarded in this case also as too high.

The cheapest satisfactory line that could be erected costs £50 a mile, and to this has to be added cost of apparatus, say £52 a mile.

£52, at 10 per cent., equals a rental of £5 4s. a mile.

The Natal charge is £7 a mile on a new pole line, or 15 per cent. on cost, and for an extension where the pole already exists, the charge is £4 a mile.

The Auditor-General is being consulted on the matter now to see if the percentage could be safely reduced.

Rhodesian Terms.

The Postmaster-General of Rhodesia states that his Department is prepared to assist farmers in the direction of telephonic communication at the cheapest possible rate consistently with business principles. There are various ways in which telephonic facilities can be obtained at cheap rates, *i.e.*:

(1) The Department is prepared to build lines on guarantee, by the persons interested, of a revenue per annum which is based on the capital cost of the line. The amount of the guarantee depends upon the length of the line and whether built of wood or iron poles.

(2) Lines can be rented at tariff shown on Postal Notice (No. 18 of 1908) or a modification thereof in those cases where the renter is willing to deal with public telegrams as well as his own business over the wire.

(3) Lines may be erected and maintained privately on payment of a small annual wayleave, not exceeding 10/- per mile.

(4) Arrangements can be made for the Department to supply the apparatus, wire, etc., and for the parties interested to build and maintain the line at a nominal rent.

He adds that he is most desirous of seeing the telephone utilised in every possible way, as there cannot be a doubt that facilities for communication with the town centres give a sense of security in outlying districts which is a valuable factor in their development, in addition to the better and quicker opportunities afforded for transacting business of all kinds.

Hail Insurance in East Griqualand.

The farmers of East Griqualand have initiated a scheme of mutual insurance against hail, the preliminary stages of which may prove of interest to residents in other parts of the Colony. The scheme is based on the following lines:—

Any person may become a member on payment of the annual subscription of 10s., in advance.

The Society to be managed by a president, two vice-presidents and a committee of seven.

Upon any insurer receiving damage to his crop or crops by hail he shall within forty-eight hours notify the same to two assessors who shall go and inspect the said damage within forty-eight hours of such notice, and after careful examination write out a report giving the area and

as nearly as possible the extent of the damage, and making careful observation as to the condition and quality of the crop prior to the hail storm

In all cases a second inspection shall be made by the assessors at or about the time the damaged crop is due to mature when they will make their valuation of the loss sustained and shall without delay forward same to the secretary

In the event of the assessors not agreeing they shall call in a third assessor when they shall decide the amount of damage by the decision of the majority

The assessors may take evidence as to previous condition of any damaged crop with a view to arriving at a true valuation

The decision of the valuators will in all cases be final

Proposals for insurance must be submitted to the secretary accompanied by premiums and a diagram of the lands insured with full description of boundaries, and must be on the forms provided by the society and subject to the rules and conditions printed thereon

The society will accept no risk when the damage to any insured crop is less than 10 per cent

That premiums shall be calculated on the following basis Wheat, 5 per cent on the insured value of the crop, Side and winter oats, 5 per cent on the insured value of the crop, Cape, Algerian, and Egyptian oats, 4 per cent on the insured value of the crop, barley, 4 per cent. on the insured value of the crop, other cereals, 5 per cent on the insured value of the crop, mealies, 2 per cent on the insured value of the crop, potatoes, 1 per cent on the insured value of the crop

For the purpose of insurance crops shall not be valued for more than the following amounts per acre —

Wheat	£2	10	0
Oats	2	10	0
Barley	2	10	0
Mealies	1	10	0
Other Cereals	2	0	0
Potatoes	10	0	0

AGRICULTURAL ZOOLOGY FOR SOUTH AFRICAN STUDENTS.

BEING A COURSE OF LECTURES ON AGRICULTURAL ZOOLOGY, DELIVERED BY DR J. D F GILCHRIST, PROFESSOR OF ZOOLOGY, AT THE SOUTH AFRICAN COLLEGE, IN CONNECTION WITH THE TECHNICAL EVENING CLASSES INAUGURATED BY THE SCHOOL BOARD OF THE CAPE DIVISION.

(Continued from Page 329)

PLATYHELMINTHES OR FLAT-WORMS *(continued)*

The flat worms may be divided into three classes I TURBELLARIA or free forms, II TREMATODA or parasitic forms, III CESTODA or very degenerate parasitic forms To these may be added as an appendix the class of the NEMERTEA, which is, however, very different from the other three

Class I.—Turbellaria.

These may be found in fresh or sea water (Fig 27) Some live in damp soil, as for instance BIPALIUM KEWENSE, a form interesting on account of its accidental introduction (with soil and plants) from some unknown region into England, Germany, Australia, and South Africa, where it is common in gardens at the Cape Others, as for instance PLANOCERA, may be found on the sea-shore, under stones, etc , and present a rather remarkable appearance, looking like a more or less brightly coloured film flowing mysteriously over the surface of rocks, weeds, etc The reason of this peculiar movement is that the *ectoderm* or skin of the animal *is ciliated* Among the ciliated cells are some which form little rod-like bodies (*rhabdites*) which can be shot out, probably for defensive purposes They recall the nematocysts of Coelenterates; indeed, some members of the class have *nematocysts* The mouth, which is often situated near the middle of the ventral surface, leads into a gullet or pharynx, which is the chief organ by which the animal procures its food, as it is muscular and can be protruded to a considerable distance. This *muscular protrusible pharynx* is characteristic of the class.

Fig. 27.—Various forms of *Turbellaria*. *a*, Convolata; *b*, Vortex; *c*, Monotus; *d*, Thysauozoon, with elevated anterior extremity; *e*, Rhyncodemus; *f*, Bipalium; *g*, Tobycelis, attached by pharynx (*ph*) to a dead worm (Shipley, after Von Graff, &c.)

Class II.—Trematoda or Flukes.

These are parasitic flat-worms, differing from the Turbellaria chiefly in structures connected with such a mode of life Thus in their adult form they nearly always have the skin or *ectoderm without cilia*, but with a *well developed cuticle*, capable of resisting the digestive juices of the host in which they live. They also possess special *ventral suckers* or discs by which they adhere to their hosts. There is a mouth which may also act as a sucker, a *muscular pharynx* (not protrusible), and a *forked digestive tract*.

DISTOMUM HEPATICUM, already described, is an example of this class.

DISTOMUM LANCEOLATUM is a smaller Fluke, and does not occur in such numbers as the preceding, though it also is found in sheep, goats, etc.

BILHARZIA HAEMATOBIA is a formidable parasite belonging to the Trematodes. It is known to occur in various places throughout South Africa, and is characteristic of the whole of Africa. It inhabits the veins of the bladder of man. The life history of the parasite is not known, but it may perhaps be conveyed in impure water, a source of so many parasitic diseases.

Class III.—Cestoda or Tape-worms.

This class includes forms which live in the alimentary tract of other animals, so that they are surrounded with an abundant supply of nourishment in the form of the half-digested food of their host. They are characterised by the *total absence of an alimentary tract.* (Compare the mode of life of Heteromita and Trypanosoma and its results.) The food is absorbed through the skin, and the ectodermal cells, which have undergone, in consequence probably of this change of function (usually sensory, protective, etc.), an extraordinary modification; they have become very elongate with long filamentous necks reaching to the surface, the body and nucleus of the cell being buried more or less deeply in the tissue beneath, which consists largely of longitudinal muscles. Beneath the longitudinal muscles is a central mass of connective tissue in which the nervous excretory and reproductive organs are embedded. As in the Trematoda, there is a *well developed cuticle,* which protects the animal from the action of the digestive fluids of the host, and there are hooks, grooves or suckers, for the attachment of the parasite to the wall of the digestive tract. There is, of course, little or no need for complex sensory organs or nervous system, and these are poorly developed. On the other hand, this mode of life does not assist, but rather hampers reproduction, the eggs for instance being carried away to develop under entirely different conditions. This may be associated with the fact that the reproductive organs are more complex than the others and the *ova are produced in great numbers.*

TAENIA SOLIUM or T. SAGINATA (Fig. 28), common Tapeworms of man, may be taken as types to illustrate the Cestoda, though they may not represent the most primitive forms. The animal is long and ribbon-shaped, being much narrower towards the head, which is a small rounded knob or *scolex* provided with four suckers, and (in T. solium) a circle of hooks for attachment. The body or *strobila* is divided up into a great number of segments or proglottids so as to present the appearance of a segmented worm, though there is reason to believe that the formation of segments is here more akin to the process of transverse division or strobilisation as in the polyp form of Aurelia, so that the "body" of the tape-worm would be a colony rather than an individual. On the one hand, so far as the nervous and excretory systems are concerned, we would seem to have an individual for the *nervous system* consists of two ill-defined ganglia, connected together in the head region, with five nerves passing off to the

suckers and two longitudinal nerves running through all the proglottids. Similarly, the *excretory system* consists of two long tubes passing through the whole length of the animal, being connected by transverse vessels in each segment. The whole would appear, therefore, to be one organism like a segmented worm. On the other hand however we find that new segments arise just behind the head, and not in the tail as in segmented worms,

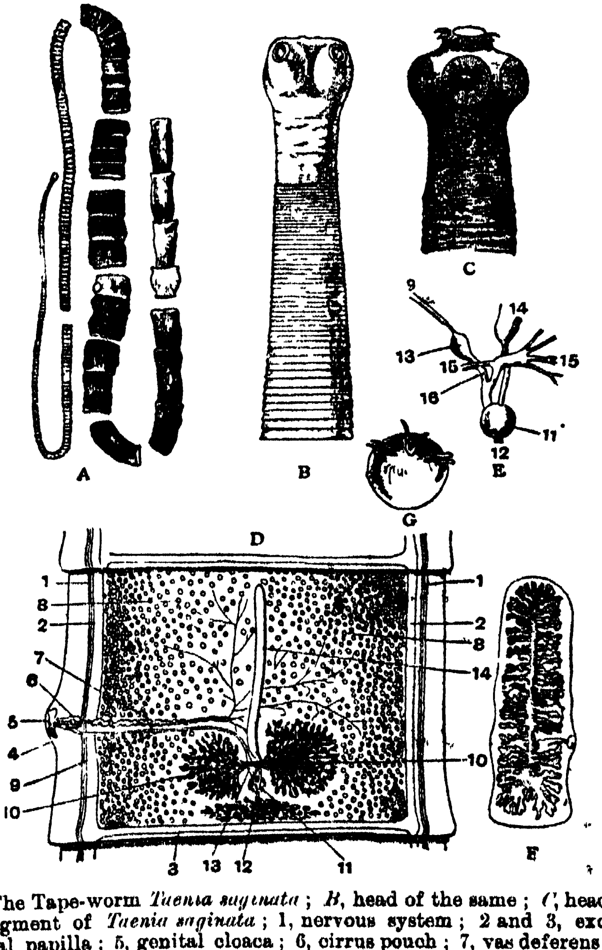


Fig. 28.—*A*, The Tape-worm *Taenia saginata* ; *B*, head of the same ; *C*, head of *Taenia solium* ; *D*, Segment of *Taenia saginata* ; 1, nervous system ; 2 and 3, excretory system ; 4, genital papilla ; 5, genital cloaca ; 6, cirrus pouch ; 7, vas deferens ; 8, testes ; 9, vagina ; 10, ovaries , 11, shell gland ; 12, yolk glands ; 13, receptaculum seminis ; 14, uterus ; *E*, The connections of the generative organs ; 15, oviducts ; 16, fertilizing canal ; *F*, Detached segment of *Taenia saginata* showing ripe uterus ; *G*, Six hooked embryo highly magnified.—(Shipley from Leuckart).

and further, each segment contains a complete set of reproductive organs somewhat resembling those of a fluke. These *reproductive organs* (Fig. 28, D) consist of many small rounded bodies (testes), from which fine ducts pass off and finally lead into one large duct or vas deferens at the end of which there is a cirrus or penis. The ovary is not single like that of the Liver-fluke,but is paired. There is a single yolk-gland and a shell-gland. A long oviduct, ending in a vagina, opens along with the vas deferens at the common opening at the side of the proglottid. The eggs when they pass from the ovary are fertilised, surrounded with a quantity of yolk, and encased in a chitinous shell, which is supplied by

the shell gland. They are then packed away in a large dilatation of the oviduct called the uterus. As the proglottids grow, this uterus becomes more and more enlarged .d filled with eggs, till the whole is nothing but a bag of eggs, and is ready to drop off at the end of the long chain.

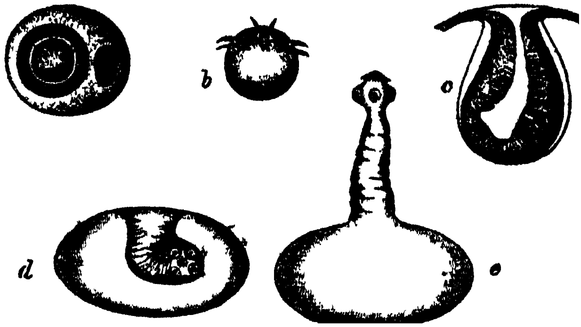


Fig. 29.—Stages in the development of the Tape-worm *Taenia solium*; *a*, egg with embryo; *b*, free embryo; *c*, rudiment of the head as a hollow papilla on the wall of the vesicle; *d* and *e*, bladder worms with retracted and protruded head. (Sedgwick partly after R. Leuckart.)

Life history of Taenia solium.

The ripe proglottids (Fig 28 F) filled with eggs pass to the exterior, and if they should find their way ultimately into the alimentary canal of the omnivorous pig, the embryos, developing in the eggs, escape and bore their way through the alimentary canal of this animal The embryo is provided with six little hooks, and on reaching the voluntary muscles begins to swell up by absorbing fluid. There is as yet no head or scolex formed, and this headless stage is known as the *proscolex*. A head begins to develop, but does not at first appear externally, as it is in a pit or invagination, so that it projects like a bud into the interior of the bladder. This is the *cysticercus* or bladder-worm stage. Pork thus infected with bladder-worm is called "measly" pork (Fig. 30), and, if eaten by man without being properly cooked, will transmit the parasite. The bud-like head becomes everted or turned inside out, and, by means of its hooks and suckers, becomes attached to the digestive tract, while the bladder part is thrown off and new segments appear in its place, and thus the ordinary tape-worm form is again resumed. (Fig. 29.)

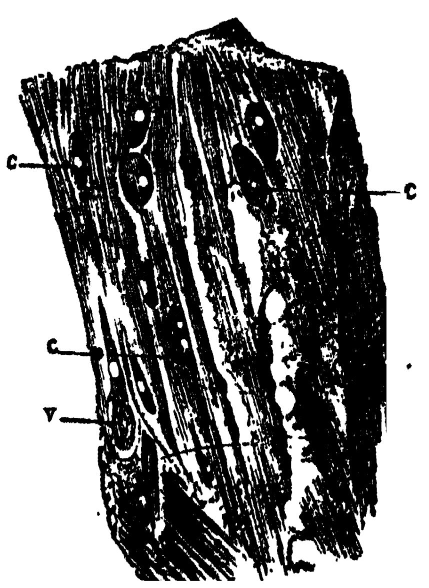


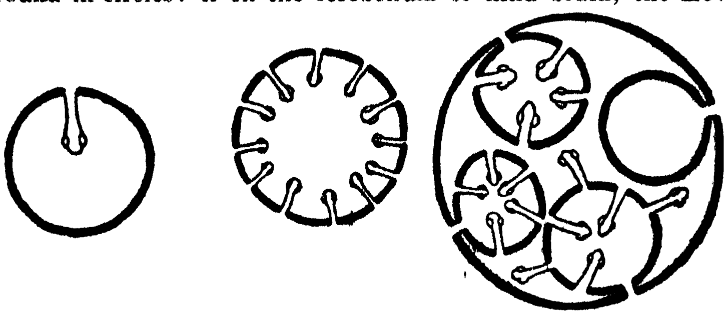
Fig. 30.—Piece of measly pork; *c*, cysticercus (bladder worm); *v*, cavity left by bladder worm. Railliet (from 8 av. Dis. Ani., Neumann.)

TAENIA SAGINATA (Fig. 28 A) lives in the intestine of a man, and its bladder worm stage in the muscles of the ox. It is the common tape-worm of beef-eating countries where adequate precautions are not taken. It is chiefly found in Western Europe.

TAENIA EXPANSA is sometimes troublesome in sheep, though not so dangerous as another form (T. coenurus) in which the bladder-worm stage occurs in sheep.

TAENIA CANINUM (CUCUMERINA), a tape-worm of the dog, has a peculiar cysticercus-like larva which occurs in the body cavity of the dog-louse (Trichodectes latus) or dog-flea (Pulex serraticeps). The dog when hunting for these insects swallows them, and thus completes the simple life-cycle of the parasite.

TAENIA COENURUS occurs in the intestine of dogs, especially sheep dogs. It is not a very long form, being about a foot or a little more in length. The proglottids when set free burst, and the eggs may be scattered over the grass on which sheep are feeding. Should the eggs be thus taken into the digestive tract of the sheep, the small larvae, each provided with six hooks, bore through the intestine and find their way to the brain or spinal cord, where they grow into bladder-worms, called "water bags" by shepherds. As the bladders grow bigger they press upon the brain, producing the disease known in sheep as "sturdy," "gid," or "staggers." Should the pressure be on one of the cerebral hemispheres, the animal turns round in circles: if on the cerebellum or hind brain, the movements



b. c.

Fig. 31.—Diagrams representing the three types of Bladder-worms; *a*, Cysticercus; *b*, Coenurus; *c*, Echinococcus.—(From Boss).

are irregular and uncertain; pressure on the optic lobes affects the eyes, while pressure on the posterior part of the spinal chord produces "lumbar-gid" or paralysis of the hind quarters. Recovery is not infrequent, but large numbers of sheep die from this disease. The bladders occasionally are on the surface of the brain, and may be removed by trepanning, but obvious preventative measures are the getting rid of the worm in the dog, and destroying by burning the heads of sheep which have died of the disease.

This bladder-worm differs from that of the cysticercus type in that the bladder may give rise to several heads; it is called a coenurus (Fig. 31).

TAENIA ECHINOCOCCUS is another tape-worm found in the dog. It is small, seldom exceeding a fifth or a sixth of an inch in length, and has never more than four segments. The bladder form however which may be found in various organs of man, pig and ruminants, is often of a very large size and sometimes produces fatal results. It represents a third type, as it may give rise not only to numerous heads, but to secondary bladders or vesicles, which are budded off and produce heads within them, or even tertiary bladders in which heads are produced. Such daughter vesicles may arise internally or externally to the mother vesicle. This type of bladder is called echinococcus, and it may be compared to the asexual generations found in other animals, so that here we would appear to have again an illustration of alternation of generation. The coenurus may also represent an asexual generation, but not the cysticercus (Fig. 31).

Life history of some Cestodes.

Cestode.	Host.	Larva	Intermediate host.
Taenia solium	Man	Cysticercus ...	Pig and other animals.
„ saginata	Man . .	Cysticercus ...	Ox chiefly.
„ expansa	Sheep chiefly...	?	?
„ coenurus	Dog	Coenurus ...	Brain of sheep, etc.
„ echinococcus . .	Dog	Echinococcus	Man and many animals.
„ sp. ?	Ostrich ...	?	?
„ caninum	Dog, etc. ...	Cysticercoid ..	Dog-flea and louse.

Classification of Platyhelminthes.

Class I.—Turbellaria, e g. Bipalium kewense, Planocera.
Class II. -Trematoda, e g Distomum hepaticum, D. lanceolatum, Bilharzia haematobia.
Class III.—Cestoda, e.g Taenia solium, T. saginata etc.

Appendix to Platyhelminthes.

Class Nemertinea.

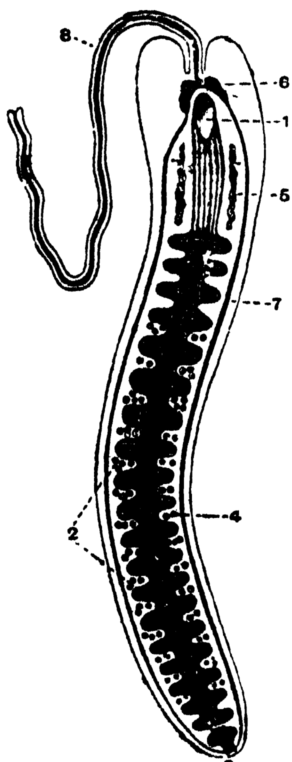


Fig. 32.—Diagram of the organs of a Nemertine. 1, mouth; 2, intestinal diverticula; 3, anus; 4, ovaries; 5, nephridia; 6, brain lobes; 7, longitudinal nerves; 8, proboscis. — (Shipley after Hubrecht.)

This group of marine worm-like animals shows some resemblance to the flat-worms though in many respects they are much more highly organised. They show, in part, the same primitive mode of progression as in the free-living forms (Turbellaria), namely by means of a *ciliated epidermis*, but they also move by means of undulations or contractions of the body though they have no feet nor bristles to assist them. They have also the digestive tract in the form of a tube open at both ends and not a blind sac, that is, they have an *anus* as well as a mouth, an adaptation that naturally follows on an improved method of locomotion (Fig. 32). The nervous system and sense organs are well developed. Thus there is a pair of ganglia in the head region, and, connected to these, there are on each side small *ciliated pits* in the ectoderm which are probably sensory organs; simple eyes may also occur on the surface of the body over the ganglia. Passing backwards from these ganglia there is on each side of the body a stout nerve chord. Another curious organ is characteristic of this group; this is an elongate *proboscis* which lies in a sheath over the anterior end of the alimentary canal and is surrounded by a band of nervous tissue connecting the ganglia. It seems to be an organ of touch and at the same time a defensive organ as it has in some cases stylets or stinging cells at its tip, when it is shot out or everted. There seems to be no typical body cavity, but there are some longitudinal tubes with well defined walls which are regarded as *blood vessels*, but may be of coelomic origin. The excretory system shows some relationship to

the flat-worms; it consists of a pair of branched tubes opening at the anterior end of the body near the ciliated pits, and in some cases at least is provided with flame-cells. Some Nemerteans have a peculiar free swimming larva (called Pilidum). It is totally unlike the adult being helmet-shaped with a dorsal spine-like flagellum and two lateral flaps.

NEMATHELMINTHES OR ROUND-WORMS.

The Nemathelminthes are worm-like in form but not segmented or divided up into sections like the ordinary earth-worm. They are *mostly parasitic* though some live in water or damp earth. The body is adapted for a wriggling form of movement being cylindrical, tapering at both ends, and provided with a *smooth thick and hard cuticle*, though in some cases a few bristles hooks or even suckers are present. Transverse ring-like markings may appear in this cuticle but they do not correspond to any segmentation of the body internally. The digestive tract is provided with *both mouth and anus*. The nervous system consists of a ring round the gullet giving off fine nerves. Sensory organs are not well developed though a few eyes may appear in the free-living forms. The excretory system consists of two canals opening by a pore. There is a large space between the digestive tract and the body wall but it does not seem to represent a true coelom as it has no distinct walls of its own. There are *no definite circulatory nor respiratory organs. The sexes are separate.*

Physiologically this group may be looked upon as consisting mainly of forms which have specialized in the direction of excessive secretion of cuticle, perhaps to be associated with a wriggling method of progression or with an effective protection especially against the digestive juices of the animals in which they live, for they are chiefly successful as parasites. So far has this physiological process gone that there are no ciliated cells at all in the animal, even spermatozoa being without the usual flagellum, characters which we find also in another chitin secreting group, the Arthropoda.

ASCARIS LUMBRICOIDES (Fig. 33), the Round-worm of man, is a suitable type which may be taken to illustrate the general features of the group. It occurs in the human intestine and has been found in the ox.

The body is elongate (4-14 inches) and pointed at both ends, the posterior end of the male, which is smaller than the female, being slightly recurved. The body is marked by four longitudinal streaks, one dorsal, one ventral, and two lateral. The mouth has a lobe over it and one at each side. A minute aperture, the excretory pore, is situated near the anterior end on the ventral surface, and a larger transverse aperture, the anus, in a corresponding position at the posterior end. In the male the genital aperture opens at the anus, but in the female there is a separate genital aperture near the end of the first third of the body.

A thick smooth transparent cuticle not only covers the external surface of the body but is turned in at the various apertures which it penetrates for a considerable distance. The cuticle is ringed so as to give a false appearance of segmentation. Beneath the cuticle is a layer consisting of a protoplasmic tissue with nuclei but with no definite cell boundaries (a syncytium), and beneath this a peculiar layer of muscular cells unlike any found elsewhere, each spindle-shaped fibrous cell being expanded on its inner side into a mass of undifferentiated protoplasm which contains a nucleus and is produced into long filaments projecting into the body cavity. This body cavity is not a true coelom as it has no epithelial lining.

The excretory system consists of two fine tubes (Fig. 33, h.) embedded in lateral thickenings of the tissue under the cuticle, which appear externally as the lateral lines. These tubes end blindly behind, but anteriorly they join together and open by one aperture, the excretory pore.

The nervous system is in the form of a ring round the pharynx, and from this are given off six nerves running forwards and six running backwards. They run in the median dorsal and ventral thickenings of the subcuticular tissue Sense organs, as is to be expected, are poorly developed, there being, however, sensory papillae in the mouth region.

The reproductive organs are not complex The testis (there is one only) is in the form of a long coiled thread (Fig 33, c). It passes insensibly into the vas deferens which opens into a wide vesicula seminalis, and this in its turn opens by a short muscular tube into the rectum Paired muscular sacs containing setae are also present here. There are two ovaries, also long coiled and thread like. Each passes insensibly into a uterus and there join together and open by the separate opening already mentioned as occurring on the ventral surface

Though one of the best known forms, the life history of Ascaris lumbricoides is not fully known. There is reason to believe that the eggs which escape to the exterior may be eaten by a millipede in the body of which they may be hatched out, the parasite again finding its way into the alimentary canal of man or the pig in vegetables or fruits in which the millipede may lie hidden.

The Nemathelminthes may be divided into three classes: the NEMATODA or forms like Ascaris with an alimentary canal, the GORDIACEA or horse-hair worms with a rudimentary alimentary tract, and the ACANTHOCEPHALA or hook-headed worms which have no alimentary canal but are provided with a protrusible hooked proboscis.

Fig. 33.—The Round-worm of man *Ascaris lumbricoides* (male) cut open to show: *a*, oesophagus; *b*, intestine; *c*, testis; *d*, vas deferens; *h*, lateral excretory canals. (Shipley.)

Class I.—Nematoda or Thread-worms.

This class includes the most typical Round-worms and those of the greatest economic importance. Though most of them are parasitic, and there is scarcely a plant or animal which is not subject to their attacks, they do not show the great modification for parasitic life seen in some less successful parasites. A few of the more important families in relation to man may be noted, such as the Ascaridae or Round-worms proper, the Strongylidae or Palisade-worms, the Trichotrachelidae or Whip-worms, the Filariidae or slender Thread-worms, the Anguillulidae or Eel-worms.

Family I.—Ascaridae or Round-worms proper.

Ascaris, the type already studied, represents this family which is distinguished by having the body not very elongate, a triangular mouth with three lips, two spicules in the male, which also has the posterior end curved. They are parasitic in animals especially in the intestine.

Ascaris lumbricoides occurs in man and is now believed to be identical with another smaller species, A suillae which is found in the pig

Ascaris megalocephala is found in the small intestine of the horse, ox, etc It is larger than the preceding, the male being as much as 7 inches in length, the female 17 inches It is of a yellowish colour The eggs are enclosed in capsules of great resistance and are thought to hatch out in water or moist earth, and infection may take place by drinking contaminated water, at any rate, no intermediate host has yet been found Horses fed on unhatched eggs were not infected The parasites do not cause much trouble, but may give rise to catarrh, colic, etc, and even secondary effects on the nervous system They can readily be got rid of, however, by a vermifuge

Ascaris mystax is found in cats, dogs, and other carnivora and has also been found in man It has finlike expansions on the side of the head.

Oxyurus (Fig 34) differs from Ascaris in having the lips feebly developed and with a distinct bulb at the end of the oesophagus O. curvula, the "maw-worm," is often troublesome in horses The female has a long, thin and pointed tail, the male being smaller and provided with one spicule only O vermicularis is a troublesome little human worm only about 10 m m in length

Fig. 34. — The Maw-worm *Oxyurus* of the Horse, female, natural size.—(From Railliet.)

Family II.—Strongylidae or Palisade-worms.

These are elongate fairly stout forms (Fig. 35.) The mouth has six papillae and the male has posteriorly a bell-shaped expansion which may be kept open by stiff ribs like an umbrella.

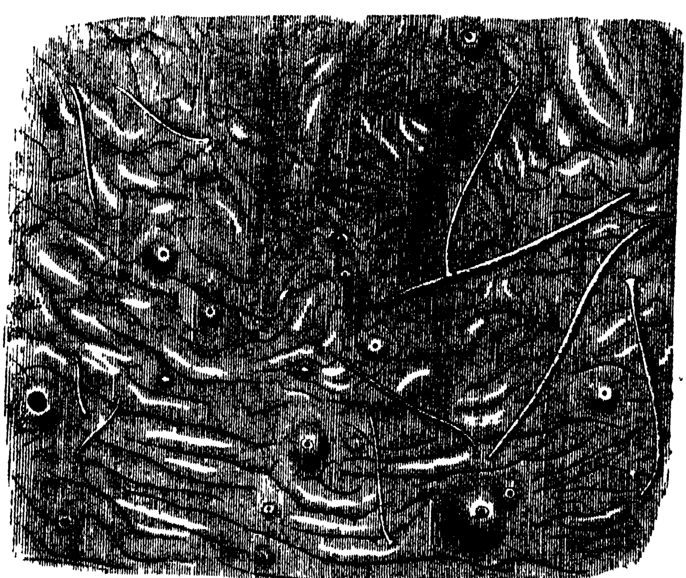


Fig. 35.—Part of the intestine of the Horse showing attached Palisade-worms and tumours caused by them. (Railliet.)

Strongylus armatus known to veterinary surgeons as the "armed strongyle" is common in the intestine (chiefly in the coecum) of the horse. It fixes itself to the walls of the intestine by means of spines at the

mouth. The eggs develope in water and are taken into the alimentary canal of the horse in drinking. They then find their way into the blood and produce swellings on the walls of the arteries especially the anterior mesenteric. They then return to the intestine and become mature males and females. The eggs pass out with the excreta of the horse, and the life cycle may thus be completed if the horse drinks contaminated water. The chief damage done, and it may be serious, is in the formation of swellings on the arteries in which the immature worm bores, setting up an irritation resulting in abnormal growth. Two other species of Strongylus occur in the horse but have a different life-history: they never get into the blood but bore into the intestine causing tumours and inflammation. When sexually mature they are free in the intestine.

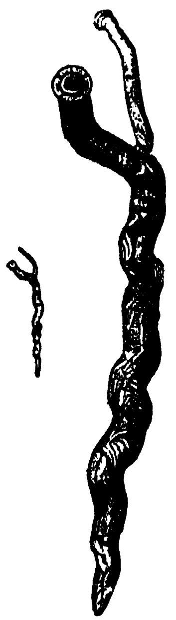


Fig. 36.—The Gape-worm in Fowls, *Syngamus trachealis*, natural size and magnified four times. (Warburton.)

STRONGYLUS CONTORTUS, the twisted stomach-worm or wire-worm of sheep, is a common pest of sheep, goats and cattle in South Africa and elsewhere. They occur in the fourth stomach or abomasum of these animals where they live on the blood which they abstract from its walls. They are reddish-brown in colour from the blood which they have imbibed and have a twisted or spiral appearance due to the arrangement of their tubular ovaries. The embryos, it is stated, will not develope in pure water, but grow rapidly in muddy water. The larvae can crawl up moist blades of grass and become very resistant to cold and dryness. Pastures can thus be infected with the worm and the flocks infected though not by drinking the water containing eggs or larvae at an earlier stage. The principal medium of infection is therefore in pasture. If kept free from sheep or goats for a year pasture may be freed from the parasites, which are found most frequently in sheep and goats in the grass veld in rainy seasons.

Several species of Strongylus in the lungs and air-passages of sheep and goats have been recorded in South Africa, e.g. STRONGYLUS FILARIA in sheep and goats, S. MICRURUS in calves, S. PARADOXUS in pigs (Hutcheon). The life-histories of these are not well known and how infection is brought about is uncertain.

STRONGYLUS DOUGLASSI is found in the stomach of the ostrich. It is attached to the roof of the stomach chiefly near the gastric glands and causes inflammation and secretion of a jelly-like mucous, a condition known to farmers as "Verrot Maag." The life-history of this parasite does not seem to be known.

ANCYLOSTOMUM DUODENALIS may be mentioned as a Strongyle which is one of the most dangerous of human parasites. The eggs develope into larvae in damp earth and pass into a resting stage in which they may be transferred to the digestive tract of man in drinking water. They destroy the intestinal wall. They are specially prevalent among miners.

SYNGAMUS TRACHEALIS (Fig. 36), the Gape, Red or Forked-Worm is another parasite belonging to this family. The name "Gape-worm" refers to the effect of the parasite on its host. It occurs in the wind-pipe and lung-passages of fowls and other birds, and causes them to open the mouth widely. The other names refer to the red colour of this small parasite and its peculiar forked appearance as if it had two heads. It

was at one time indeed supposed to have two heads, a smaller and a larger. The smaller is however now known to be the male, which remains permanently attached to the female. When mature the female is full of eggs, and is ejected from the mouth of the fowl. It dies, and the eggs are set free, and develop in damp ground or water, from which they are again conveyed to other fowls without an intermediate host. The disease may thus spread rapidly in a fowl-run so infected, and affected birds should be isolated and treated by injection of fluids into the trachea.

Family III.—Trichotrachelidae or Whip-worms.

These are small worms. They have a very long body, thin and thread-like anteriorly, where a small mouth without lips is situated, and larger posteriorly, where the genital organs occur.

TRICHOCEPHALUS is parasitic in the alimentary tract of mammals being attached by its slender end. They sometimes cause serious disturbances. They have no intermediate host, and the embryo while still unhatched may be taken in drinking water.

TRICHINA SPIRALIS (Fig. 37) is the cause of the disease known as "Trichinosis." It is a very small worm, being scarcely visible. The females are larger than the males, being from 3 to 4 m.m. in length, the males 1·4 to 1·6 m.m. Males and females occur in the alimentary canal and an immense number of eggs are produced, 10 to 15 millions by one female it is said. The eggs are hatched in the uterus, and the larvae pass out by a genital pore. They begin to bore their way through the intestinal wall, and various tissues, being often carried by the blood. They find their way mostly into the muscles, where they become encysted in a calcareous capsule (Fig. 37) in which they may remain for years. If such flesh is eaten by another animal the gastric juice dissolves the cyst and sets free the parasite, which after a free life again produces young, which again penetrate the intestine and other organs. The irritation produced by the passage of these fine parasites is often very serious and fatal. Pigs are frequently affected, and their flesh may thus contain the encysted form and man may be infected by insufficiently cooked pork. Rats suffer from the parasite, and, as these animals are often eaten by pigs, the disease is spread rapidly.

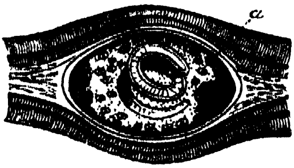


Fig. 37.—*Trichina spiralis*, embedded in muscle; *a*, calcareous deposit.—(From Leuckart.)

Family IV.—Filariidae or Slender Thread-worms.

Six oral papillae often present, and sometimes a horny oral capsule; two unequal spicules or only one; four pre-anal pairs of papillae with the addition sometimes of an unpaired one.

FILARIA is longer and more slender than Ascaris. It does not live in the intestine like Ascaris. F. PAPILLOSA is a form about 6 inches in length, found in the peritoneal cavity of the horse. FILARIA SANGUINIS HOMINIS NOCTURNA is found in its larval form in the blood of man, and it is remarkable that though found in large numbers in the blood during the night they disappear during the day. F. IMMITIS is found in the heart and pulmonary artery of the dog. Some are found in the eyes of cattle, F. LACRYMALIS being common in South Africa, F. OCULI comparatively rare (Hutcheon).

Family V.—Anguillulidae or Eel-worms.

These are small worms mostly free livng; some live in decaying matter, and some are parasitic in living plants giving rise to various diseases. They may be found in vinegar (Vinegar-eel) or in paste (Paste-worm) in which they produce fermentation.

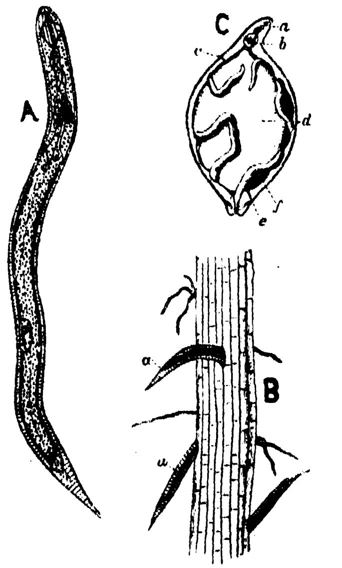


Fig. 38.—The Eel-worm, Heterodera schachtii. A, larva; B, larvae (*a*) boring into root; C, female showing boring spine (*a*), sucking pharynx (*b*), excretory pore (*c*), alimentary tract (*d*), anus (*e*), ovary (*f*).

The parasitic and saprophytic forms are provided with a sharp spine, by means of which they can penetrate the living or decaying tissue of plants. This spine can be worked back and forward.

HETERODERA SCHACHTI (Fig. 38), the Beet Eel-worm, occurs not only in the beet but also on roots of tomatoes, etc. It produces large swellings or galls on the roots.

The adult female, only about a fifteenth of an inch in diameter, is rounded and contains three or four hundred eggs. The eggs may hatch out in the female or they may occur in gelatinous masses. When hatched out, the larvae, at first free in the earth, seek out the small roots and bore their way into them causing swellings. They are at first long and of the general nematode form, but when they enter the plant they become rounded. Those which develope into females become greatly distended and globular in form and the generative organs are formed. When mature the female is brought to the surface of the root by rupture of the swellings but remains attached to the roots. The larvae, which are to develope into males, do not continue to grow, and they shed their skin from which they emerge as an elongate form not unlike the usual nematode. They bore their way out of the root and begin to search for a female. It takes about five weeks to complete the development from the egg to the adult stage and there may be seven generations in a year.

HETERODERA RADICICOLA, the Root-knot Eel-worm, has recently attracted attention in South Africa as a pest of potatoes. Its life-history is very similar to that of H. schachtii. It causes swellings on the surface of the potato (Fig. 39) and, if these be opened or thin slices of the potato made, small clear globules about the size of a small pin-head may be seen. These are the bodies of the females filled with eggs. It also attacks roots of various plants, such as tomatoes and beans.

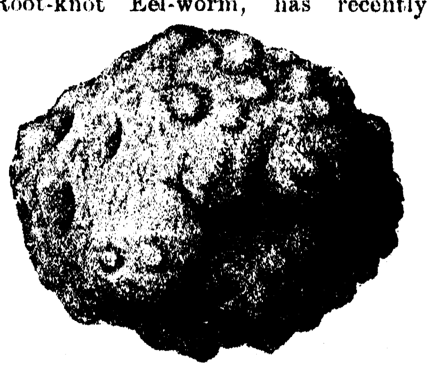


Fig. 39.—Potato, showing attack of Root-knot Eel-worm or Root Gall-worm.

TYLENCHUS TRITICI, the Wheat Eel-worm, causes a disease known as "purples," "ear-cockles," or "peppercorn." They occur in the ear of wheat as dark purplish masses like seed. These masses or galls contain large numbers of the worm which is small and transparent (1/27—1/30th of

an inch). The galls may be sown in the soil with the wheat, and, as the seed generates, the parasites escape from the galls and attack the roots gradually working up to the stem: they get into the developing ovary of the flower, where they produce a gall-like growth of a greenish then purplish colour. When they enter the flower they pair and produce numerous eggs from which larvae arise filling the seedlike "ear-cockle."

TYLENCHUS DIPSACI, the Stem Eel-worm, is found in the stem, branches and leaves of various cultivated plants, such as rye, oats, potatoes, clover, etc. It is one thirteenth to one fifteenth of an inch in length. It is never found in the roots. The disease produced is best known in its effects on rye. In the growth of the young plant no abnormal appearances are presented. After a time however some become of a yellowish colour and die; others grow luxuriantly and the base of the stem becomes much swollen. The leaves remain short and become thick and in some cases frilled, and though such plants may bear fruit, it is small and the ear is often deformed. The worm remains in the soil and the eggs and larvae are capable of withstanding very adverse surroundings. New ground may even be infected by infected straw which may be spread over a field in farm-yard manure.

Heterodera schachti has not been recorded in South Africa, but H. radiciocola seems to be very common. Tylenchus tritici does not seem to have been recorded as yet though it may be present. The Stem Eel worm, T. dipsaci (devastatrix), has begun to attract attention as a pest of lucerne.

Class II.—Gordiacea.

Sometimes in pools of standing water there may be seen long thread-like objects evidently alive as they twist about actively among the water plants (Fig. 40). They look like horse hairs come to life and are often popularly supposed to have arisen in this way. They are, however, worms allied to Nematodes though the *mouth and alimentary canal are degenerate in the adult.*

Fig. 40.—A female Horse-hair worm *Gordius* twined on a water plant; *a. a*, eggs deposited in clumps and strings.—(von Linstow.)

The eggs of these free forms develope into embryos provided with a circle of spines by means of which they bore their way into various water animals chiefly larvae of gnats and mosquitoes. They become encysted and when the host is eaten by other and larger aquatic insects they develop in the body cavity of this new host into elongate forms which again pass into the water. There are only two genera in this class, GORDIUS, the freshwater form, and NECTONEMA, a marine form.

Class III.—Acanthocephala.

These are elongate parasitic round worms placed near the Nematoda but differing from them in having no mouth nor alimentary canal. They have, however, a well developed proboscis armed with hooks. The adult lives in the alimentary canal of its host (chiefly fish) and the larvae are found in small water crustacea. ECHINORHYNCHUS is the most familiar example.

Classification of Nemathelminthes.

Class I.—Nematoda:—

Family I.—Ascaridae, e.g., Ascaris lumbricoides, A. megalocephala, A. mystax, Oxyurus curvula, O. vermicularis.

Family II.—Strongylidae, e.g. Strongylus armatus, S. contortus, Ancylostomum duodenalis, Syngamus trachealis.

Family III.—Trichotrachelidea, e.g. Trichocephalus, Trichina spiralis.

Family IV.—Filariidae, e.g. Filaria papillosa, F. Sanguinis hominis nocturna, F. immitis, F. lacrymalis, F. oculi.

Family V.—Anguillulidae, e.g. Heterodera schachti, H. radicicola, Tylenchus tritici, T. dipsaci (devastatrix).

Class II.—Gordiacea, e.g. Gordius, Nectonema.

Class III.—Acanthocephala, e.g. Echinorhynchus.

(To be continued.)

LUCERNE TYLENCHUS.

PRELIMINARY NOTE ON AN APPARENTLY SERIOUS STEM SICKNESS OF LUCERNE.

It is officially announced that a disease, which may render the culture of lucerne on infected land unprofitable as a permanent crop, exists in many parts of the Colony. The trouble is due to *Tylenchus dipsaci* (*devastatrix*), a stem-infesting nematode worm long known in Europe as a pest to rye, oats, onions, hemp, potatoes, clover, lucerne, and numerous other plants, wild and cultivated, but a creature not hitherto recorded to exist in South Africa. When adult it is a slender white worm about a fifteenth of an inch long, and owing to its small size it is barely discernible in any stage to the unaided eye. It exists in large numbers in above-ground parts of infested plants, and causes characteristic distortions and discolourations which serve to indicate its presence. Infested shoots may fail to grow out more than a few inches, and the whole plant languishes, and in the course of months, or perhaps of a year or more, it succumbs entirely. The infection is spread from one plant to another in a variety of ways, and gradually so large a proportion of the plants in an infested field becomes diseased, that the crop of lucerne is not worth cutting or feeding off. The damage cannot be met by cultivating and re-seeding the land, as young plants among old diseased ones are quickly invaded and killed; and it likewise appears that badly infested lands that are ploughed and re-sown are doomed to fail again in a short time.

The presence of the disease became known to the Government during the past season only, and before then its nature and importance seems not to have been suspected by anyone in the country. It is now clear that it has been established in widely separated districts for three to four years or longer, and it is probable that it has been common in Oudtshoorn district for at least six years. Failures due to it have been attributed to many general causes for decline, such as drought, over-irrigation, unsuitableness of soil, over-stocking, age, lack of cultivation and unfavourable treatment in other respects, and very few farmers of the many whose lands have been ravaged have supposed that anything out of the ordinary was the matter. Consequently little has been said of any trouble, the disease long escaped recognition, and it is now difficult to determine its real importance. The information at present available upon important phases of the subject is still meagre, and the present announcement would be premature were it not for the pressing advisability of warning farmers, without further delay, of the danger of introducing infection into clean lands. Further, an official statement is desirable to set at rest highly exaggerated reports which are being circulated. A lengthy account, embodying the results of observations in South Africa and of enquiries in Europe, North and South America, and Australia, will be compiled and published as soon as practicable, and this statement should be regarded merely as a preliminary and unavoidably imperfect contribution.

Europe, in all probability, is the source from which the pest was introduced; and notwithstanding the many other channels in which the infection might have come and might be spread, grave reasons have been found for supposing that the infection reached the country with lucerne seed, and that it is being spread chiefly by the agency of lucerne seed.

Outbreaks so far located, which seem traceable to imported seed, are few in number, whereas numerous ones seem traceable to Cape grown seed. And a fair deduction from the incomplete knowledge at present possessed is that imported seed, while generally free of infection, has been responsible for a few initial outbreaks, and that Cape grown seed from some of the leading sources of supply has been much infected in recent years, and has rapidly spread the pest. The trouble has been discovered to be exceedingly widespread in Oudtshoorn, and to be in Worcester, Ladismith, Beaufort West, Graaff-Reinet, Somerset East, Uitenhage, Bedford, Fort Beaufort, Cradock, and still other districts. It is unlikely that a single district in which lucerne is largely cultivated has altogether escaped infection. And although the acreage at present affected is probably still small compared with the acreage that has so far escaped, there is not the remotest chance that the pest could be economically extirpated.

Most circumstances and conditions that tend to create or to retard the growth of lucerne diminish the resistance of the plant to the pest, and hence, in general, those plants which are suffering from some other cause are the first to succumb. Yet the pest seems abundantly able to kill out plants in an otherwise most favourable environment for healthly development. That is, there is evidence that lucerne may become infested and die out owing to the pest alone in all kinds of soil, and both where it has too much and where it has too little water.

Inasmuch as it is impracticable to examine every plant, even the most competent of inspectors might easily overlook a slight degree of infection in a field. But the effect on the growth of the plant is such that the trouble may be fairly easily detected, where much of it is present, after the observer once learns to distinguish it. There is almost invariably a pronounced swelling of the stems. The swelling may involve the whole of a new shoot, or may be confined to the base or to any other part of the stem, or to the buds. A single one or more of the shoots may be affected, and a plant which has many affected has a peculiarly stunted, unhealthy appearance. A shoot which may be only a twelfth of an inch in diameter where it joins the crown may suddenly enlarge to nearly a quarter of an inch. Whilst broadened, the shoots are shortened, and the bases of the leaves are densely crowded along the thickened part. Then the sheath-like bases of the leaf stalks, which should be whitish, are generally tinged with brown, and more or less of the surface of the thickened parts is likewise discoloured. Shoots which have been long affected may have brownish stems, quite as if they were stained with tobacco juice. The pith of diseased shoots is generally brownish for part of its length, and often is ragged and very much discoloured throughout. Within the discoloured pith and under the discoloured epidermis, and at the base of discoloured leaf sheaths, the worms are to be found. Superficially they somewhat resemble the fine whitish hairs which clothe the plant, but the fact that they squirm slightly enables one to distinguish them with a pocket magnifying glass. As a rule they are most numerous where the discolouration is greatest, and often they are so numerous in the pith as to appear to the unaided eye like a tangle of white thread. Sometimes the diseased shoots grow up and then betray the trouble by a partial blanching of the terminal growth, and often diseased buds are also abnormally pale.

Careful studies made in Europe have demonstrated that at certain stages of its life the worm is able to come to rest and then to retain its vitality unimpaired for a long period without food or moisture. This may happen in the surface soil or in the dried remains of plants. It is because of this remarkable characteristic that the pest is most to be feared. Infected stems which are made into hay may establish infection at a distance, and infected soil may be carried by water or on the feet of animals

and on wheels, and may even be blown by the winds into nearby fields, and worst of all dormant infection may accompany seed. The present distribution of the trouble, however, suggests that years may elapse before it spreads even across a road or a water furrow; and hence, by the exercise of suitable precautions, there is hope that the farmer can greatly retard the progress of the pest through his lands.

It seems probable that a well established stool of lucerne may be attacked and killed within a season and practically all the plants in some fields into which the pest was undoubtedly introduced with the seed have died by the end of the third year. Such quick cases of failure can best be explained by assuming that the seed was grossly infected, and that it scattered the pest more or less uniformly all over the land, thus establishing innumerable centres of infection which soon coalesced. On the other hand, cases of apparently slow spread can best be explained on the assumption that few centres were established, as might happen when the infection is brought in by chance on the feet of stock or in similar ways or if only traces of infection came with the seed. Most infected fields so far found are still profitable. The spread from plant to plant seems erratic, and many apparently uninfected isolated plants are to be found in lands in which most of the plants are dead or dying. The diseased condition of lands seems most noticeable in the early spring, and plants which then look very sick may appear to recover later on when the growth is naturally more vigorous. At one place where the trouble was first seen over three years ago, it is said to have ceased to spread in lands, and to have died out in one block. It is possible that its disappearance, or more probably its temporary suppression, has been due to inadvertent cultural and other treatment of the land, and that this treatment if elucidated could be imitated elsewhere.

The trouble has been known in Europe for nearly a century, and perhaps longer, and the worm itself became known to science over fifty years ago. It was discussed as a lucerne pest as far back as 1881, at which time the strain found in lucerne was thought to be a species distinct from that previously described. Recent authorities regard the strain in lucerne, however, as identical in species with the strains found in numerous other plants, but it is regarded that a strain long accustomed to a particular kind of plant does not take readily to other kinds of plants. Over fifty kinds of plants are recorded to be subject to attack by the species in Europe, and the list of food plants includes several weeds found in infected Cape lucerne fields; but up to the present, lucerne is the only kind of plant in which the worm has unquestionably been found in the Colony.

Enquiries in Europe have not elicited unpublished information of much value in combating the pest. As far as has been learned it is not a pest of much importance in European lucerne fields, but this may be merely because various other troubles have led to a practice of growing lucerne chiefly as a rotation crop, and not as a permanent one. The leading measure for the control of such a pest as this one is crop rotation, and the alternation of maize, or some other crop or crops, with lucerne seems to promise most as a remedy for this one at the Cape. The intervening crops adopted should in time become those which experience demonstrates to be immune, or practically immune, from attack in order that the pest may be starved. If started with clean seed on cleaned land, lucerne may be found to last as long in a rotation as it is ordinarily profitable without renewal when stock is run on it, say six to eight years. As a substitute for rotation, successive waterings coupled with almost continual close browsing by birds for a few months seems worth a trial. The watering might result in bringing to life and forcing into the plants most of the worms that would otherwise lie at rest in the soil, and the close feeding

down of the lucerne without giving any worms a chance to mature might result in most of them being devoured and thus destroyed.

The problem of helping the farmer to get uninfected seed, and that of finding some means of eradicating or of diminishing the infection when questionable seed must be used, have still to be worked out. It is suggested from Europe that seed be soaked in very dilute sulphuric acid as is done to destroy an allied pest in wheat seed, but experiments already conducted in Cape Town have shown that lucerne seed itself is killed by the acid. Other substances are being tried, but the chances appear to be much against finding a fully satisfactory treatment. At present it is not known in what way the infection accompanies seed; and if it is within the seed, as seems almost certain by analogy, how such seeds may be distinguished from healthy ones In general, imported seed seems to be safer to plant, as regards this trouble, than Colonial grown seed; but at the same time it is obvious that the safest seed is that from South African sources which are known to be clean. Imported seed passes through many hands, and there is no means of tracing a particular lot back to its local source. The dealer in South African seed, on the other hand, often has the opportunity of inspecting the fields from which his supplies are obtained, and doubtless some fully reliable dealers will be able to guarantee that what they offer is free of infection. It may be added that Europe has several lucerne diseases which are not known in South Africa, and on general principles it is therefore preferable to use South African grown seed. The root rot fungus common in Provence might prove a worse trouble than Tylenchus if it got established in this country. It has got to America, and is said to be a serious disease in some parts. Many farmers at the Cape who still have perfectly healthy fields should be able to supply their own needs for seed, thus avoiding any risk of a new trouble.

The course which a farmer had best follow when Tylenchus gets into his lucerne lands varies with the individual circumstances. If it seems reasonably certain that only a very small part is infected, the immediate uprooting and burning of all plants on it, and the keeping of it as free as possible from all plant growth for a season, meanwhile occasionally watering it to bring to activity, and hence to starvation, the worms that are in the soil, may be the best policy. If on the other hand a considerable proportion is more or less infected, the sacrifice suggested may be utterly unwarranted; and the same may be the case if surrounding farms are considerably affected when one's own is nearly clean. The close feeding down of the lands, watering them to get the worms out of the soil but not allowing the plants much time to grow, may then be much better policy. When infested fields are ploughed out, great care should be taken to get rid of the lucerne entirely, and the rotation crop that follows had best be one that requires good cultivation. Maize is probably as good as any, for one reason because it is not known to be subject to attack by the worm. The soil may become fairly clean in a single season; but the chances seem against it, and hence the lapse of a longer interval is desirable before lucerne is again planted. Whether any special steps are or are not taken to suppress the pest, traffic from infected to clean lands should be avoided as far as practicable. This applies to movements of water, hay, manure, farming implements, vehicles, men, and animals. Hay from infected fields should be consumed on the farm, and seed should never be taken from them. In conclusion, it is notified that the Government Entomologist, Department of Agriculture, Cape Town, and the Eastern Province Entomologist, Grahamstown, will report by post on any specimens of lucerne, suspected of having the disease, submitted to them by farmers. Several whole stools, cut off at the ground level, should be sent.

EXPERIMENTAL CROPS IN THE CAPE COLONY.

By R. W. Thornton, Government Agriculturist.

For a number of years now the Agricultural Department has distributed seed for experimental purposes to farmers throughout the Colony, on condition that a report is furnished on the success or otherwise of the trial. Any new crop that is heard of and that is likely to prove of any value is procured and distributed, and it is greatly to be regretted that until lately only about twenty-five per cent. of the applicants sent in reports. This state of affairs, I am pleased to say, has improved lately These reports are the only guides we have as to the success or failure of a crop in any particular district. It must be remembered that failures, as well as successes, must be reported, as it is only the reported failures of a certain crop in different districts under favourable conditions that makes it possible to abandon such a crop as valueless under the best of conditions in the locality in which it was used.

Grasses.

It is very gratifying to note that as a result of the free distribution of grass seeds for experimental purposes, farmers are beginning to lay down large paddocks and plots to those varieties that have proved a success in their respective districts, chief among these being paspalum, tall fescue (*Festuca elatior*, sub-species *Arundinacea*), cocksfoot, perennial and Italian rye grasses and phalaris commutata, the last named is quite a recent importation from Australia (see Cape Colony *Agricultural Journal*, Vol. XXXIV, January, page 26). Many of these seeds can now be obtained from the larger dealers in agricultural seeds. To obtain the best result, the usual ancient method of one ploughing and harrowing is not the best for grass, but the ground must be reduced to as fine a tilth as for lucerne. To do this, ploughing, cross-ploughing, harrowing and cross-harrowing before sowing, and rolling after sowing, are necessary. Many farmers who have sheep and no roller run a flock of sheep over the land to lay the soil firm over the seeds. This is a very good practice. It must be borne in mind, however, that rolling whilst the ground is wet is worse than useless, as instead of getting a fine loose surface we get a hard cake through which the delicate young seedling cannot push. After reducing the land to a fine tilth the seed may be sown broadcast or in drills, harrowed lightly, and then, if possible, rolled. If the land is poor and unable to grow a cereal crop, the application of fertilisers is necessary if the best results are desired. The fact that our cereals are grasses must not be overlooked.

Paspalum Dilatatum.

This grass has now become a prime favourite with a great number of farmers, proving valuable as a source of hay or as grazing. It seems to be more adaptable to grazing, as the more it is grazed off the quicker it stools, finally covering the ground. Where frosts are not severe, or damp air and soil render the frost less destructive, paspalum remains green

throughout the year, providing hay in summer and grazing in winter, and shoots out with the first rains in spring. It will grow on most soils, but does best in damp situations or provided it is kept moist under irrigation, although this year it grew to a height of six feet on the Cape Flats without irrigation, and three cuttings were obtained, but this particular soil was well manured with stable manure. The seed may be sown at any time during the spring and summer from August to October being the best time if rainfall and temperature are suitable. There are two recognised methods of establishing paspalum. The first is to sow the seed in seed beds and transplant into the field. The plants are either set out 18 inches or 2 feet square This method, though sure, is laborious and costly. The method now almost universally practised is to sow the seed broadcast on well-prepared land and harrow it in lightly. Sowing at the rate of 10 lbs per acre has given the best results. Wherever summer rains prevail or water for irrigation is obtainable, sowing the seed broadcast should be practised, as this reduces the labour and expense considerably. Paspalum seed as a rule takes from 21 to 30 days to germinate, and during the cold weather the seeds fail to germinate. Therefore, the conditions necessary to ensure good germination are heat and moisture. From sixty-three reports received, eight results were negative owing to the failure of seed to germinate through climatic conditions, thirteen were of an indifferent nature, the principal cause being frost, the rest were good as the following table will show The remarks are extracts from the reports as returned by the farmers The total number of reports on paspalum received up to date is 200, of which 120 are decidedly favourable. Only 30 failures have been recorded, and the remaining 50 are indifferent.

Barkly East (Mr. L J. Naude) --Sown August. Result: Indifferent. It will not do in these parts, as it was destroyed by frost.

Bredasdorp (Mr. F. Rahmer) --Result: Good. Sown July. Sown broadcast on unirrigated land; it took six weeks to come up, but is now doing well.

Caledon (Mr. C. Fourie)—Sown July. Result: Good. Seed took two months to germinate, but is now doing well. Suitable if sown on sandy soil earlier in the season.

Clanwilliam (Mr. W. P Burger).—Sown May. Result: Good. Sown on new dry land broadcast Reaped in December for the first time. Consider good for district

(Mr. C. J. Grove).—Sown December. Result: Indifferent. Sown broadcast on irrigated sour sandy land: it came up well but has grown very little since promising badly.

(Mr A. Leipoldt) —Sown January and February. Result: Indifferent Grew fairly until killed by frost.

Cape (Mr. E. Goldsmith).—Sown March. Result: Good. The plants were planted out in September on sandy soil. Grass grew to a height of 6 feet. No farm should be without it.

(Mr. E. Gray).—Sown: No date given. Result: Indifferent. I do not think it will do on sandy soil of the Cape Flats.

(Mr. F. J. Noonan).—Sown March. Result: Good. Thriving well.

Calvinia (Mr. F. E. Turner).—Result: Fair. Sown June. Sown broadcast on dry, well-prepared land. Consider it will do in district if a little trouble is taken with it.

Cathcart (Mr E. E. Kemp).—Sown December. Result: Fair. Sown broadcast on dry black land; the few plants that came through did well and withstood the drought. Given a fair summer it will do well in the district.

(Mr. W. A. Hart).—Sown January Result: Good. Broadcasted on dry land it did well Consider it a very fine grass to stop silt and prevent washing by rain, as it spreads so rapidly.

Ceres (Mr. D. J. Joubert).—Sown September. Result: Good. Seed sown broadcast. Consider this the best method, as planting out is too expensive. Stood frost and drought well.

(Mr J. E. de Villiers).—Sown October. Result: Indifferent Planted out it thrives well, but do not think it will pay. It does well on well worked and manured land, but does not seem to do on the veld.

Griqualand East (Mr. E. J. Hulley) —Sown March. Result: Good Seed was sown thinly on damp low-lying sandy soil and is doing well. Payable.

(Mr. E. H. Eddy).—Sown September Result: Good. Up to April, when reported on, it had done well. Cannot say how it will stand frost.

(Mr. A. R. Shepperson) —Sown October. Result. Good. Consider it suitable for district.

(Mr. E. B. Shepperson).—Sown November Result. Good Doing well, but unable to say how it will stand the winter.

(Mr. J. N. Dodd).—Sown November. Result: Good. Sown on dry land; it is doing well.

(Mr. W. A. Harvey) —Sown September. Result. Indifferent Do not consider it suitable, as frost is too severe.

(Mr. E. Hawkes).—Sown January. Result: Good Sown broadcast on dry land; it is doing well, being grazed off by stock. Consider it suitable to district standing frost and drought.

(Mr. A. W. Francis).—Sown August and January. Result. Good The seed sown in August did not germinate well, but that sown in January did exceedingly well. All stock are fond of it

(Mr. J. J. Malherbe). -Sown December. Result · Good. Sown broadcast thickly on dry poor red soil; it did very well, growing to a great height and coming on well after being mown Although frost nips it, it comes on quickly again in the spring.

(Mr. A. Eckrow).—Sown January. Result: Good Sown thickly on unirrigated ground it did well. Consider it a splendid summer grass.

(Mr. J. McFarlane).—Sown September. Result: Good. Sown on dry land, it did splendidly, giving good grazing, but died off in winter after seeding.

(Mr. J. Brink).—Sown February. Result: Good. Harvested crop of seed from experimental patch and sowed one acre with it Doing well, but think it should be rolled after sowing.

(*Assistant Conservator of Forests*).—Sown January. Result: Good Out of five sowings four were very successful and are doing well It has a tendency to die down with severe frost and drought, but on arrival of spring rains it revives and grows again, providing good feed for all stock.

George (Mr. F. A. Robertson).—Sown May. Result: Indifferent. Although the plants have stood for eighteen months it does not make any headway. Consider it unsuitable.

(Mr. L. Groenewald).—Sown: No date given. Result: Good. Sown broadcast on rich soil and irrigated. It did well. It is a hardy grass and killed out sorrel when planted in ground filled with it. Would suggest planting it to overcome this weed.

(Mr. J. Robertson).—Sown September. Result: Good. Sown thickly in drills, and irrigated it gave good results, being readily eaten by stock. Consider it the "lucerne" of these parts. It stands drought, but prefer moist ground.

Graaff-Reinet (Mr. S. Rubridge).—Sown: No date given. Result: Indifferent. Do not think it will do at so high an altitude on account of the frost.

Humansdorp (Mr. J. P. du Plessis).—Sown October. Result: Good. Seed was sown broadcast and irrigated, when it grew luxuriantly. Sheep are very fond of it.

Knysna (Mr. Humber).—Sown June. Result: Good. Sown broadcast on dry land it is doing well.

King William's Town (Mr. J. Field).—Sown February. Result: Good. Sown on poor sandy soil, dry, it came on well, supplying good winter feed.

(Mr. G. D. van Rensburg).—Sown January. Result: Good. Sown broadcast on dry light soil, well manured with kraal manure, it grew splendidly, having an occasional rain. It seems as though it cannot be destroyed by grazing, as the more it is grazed the faster it spreads.

Middelburg (Mr. H. Glass).—Sown January. Result: Indifferent Sown broadcast and irrigated, the seed came up well, but a frost nipped it in March, since when it has not recovered. Do not consider it suitable owing to severe frost.

Paarl (Mr. O. Monnig).—Sown August Result: Indifferent. Very little seed germinated.

(Mr. W. E. Rooke).—Sown September Result: Good. Seed was sown on rich damp soil and did well Does not do on dry soil in this district.

Piquetberg (Mr. D J. Kotze).—Sown September. Result: Indifferent. Did not do well on dry ground. Think it ought to be irrigated.

Riversdale (Mr. J. A. Kock).—Sown January. Result: Indifferent. Sown on damp sandy soil and irrigated, it did very badly. Do not consider it a suitable grass for the sandy soil of the district.

Robertson (Mr. F. W. Brown).—Sown September. Result: Good. Sown in the valley it did splendidly, but do not think it will do on the Karoo soil. It will pay well.

(Mr. G. van Zyl Wolfaard).—Sown October. Result: Good. Sown on sandy soil thickly, it did not do well at first, but is doing well now. Sown rather late.

Simonstown (Mr. J. C. B. de Villiers).—Sown July. Result: Excellent. Sown on unirrigated sandy land, it did well, growing to 5 feet high. Consider it very suitable, but think it will do better if sown and then transplanted.

(Mr. C. van der Pohl).—Sown July. Result: Good. Sown in beds and transplanted on irrigated land it gave a cutting 5 feet long. Recommend it for vleys.

Somerset East (Mr. A. J. van Zyl).—Sown August. Result: Indifferent. Sown broadcast on irrigated ground it came up well, but did not grow to perfection. Do not consider it suitable.

Stutterheim (Mr. A. Hapelt).—Sown December. Result: Good. It grew well sown broadcast on dry land. Think it ought to be sown earlier.

Swellendam (Mr. D. S. Moodie).—Sown September. Result: Good. Transplanted on irrigated land it does well when once established.

(Mr. Chas. Marais).—Sown August to December. Result: Indifferent. Do not consider it suitable to district, as water and manure are too scarce.

Tulbagh (Mr. C. Plumbly).—Sown April. Result: Indifferent. Although the seed germinated well, the plants did not grow to perfection.

Cocksfoot Grass (Dactylis glomerata).

This is essentially a grazing grass for sheep, and is more adapted to the Eastern Province with its summer rainfall, for despite previous reports, the general tendency for cocksfoot is to go down before severe drought and heat. It has given good results in the North-east, which bears out previous reports. Cocksfoot and Devon Evergreen Rye grass mixed make a very good pasture. Of the sixteen reports received, one farmer reports that the seed failed to germinate, two failures were due to drought, and two indifferent results were obtained. The total number of reports received to

date is 67, including those published in previous *Agricultural Journals*, of which 37 are favourable.

Barkly East (Mr. A. W. Islid).—Sown February. Result: Good. Two pounds of seed was sown thickly on dry black loamy soil. Provided good feed for all stock. Will take a lot of beating.

Cape (Messrs. Davies Bros.).—Sown August. Result: Failure. Failed to germinate.

Cathcart (Mr. J. Field).—Sown February. Result: Good. The grass is very productive, and resists dry weather well. Fed off in June. Consider it very suitable to district, and recommend mowing or grazing down to encourage it to stool out.

(Mr. J. R. Hart).—Sown: No date given. Result: Negative. Failed on account of drought.

Ceres (Mr. J. E. de Villiers) —Sown October. Result: Failure. Sown in beds, and well looked after; it grew for a time and then failed. Not worth growing in this district.

Griqualand East (Mr. J. H. Dodd).—Sown February. Result: Good. Doing well.

(Mr. J. J. Malherbe).—Sown December. Result: Good. Turned out excellent, and thrives well on poor red soil. Sown broadcast on dry land.

(Mr. G. H. Edy).—Sown November. Result: Good. It is an excellent grass, and was sown on poor dry land. The season was wet. Stock are apt to tire of continually feeding on it, and it is suggested mixing grasses when sowing, but make cocksfoot the principal grass.

(Mr. A. J. Hawkes).—Sown January. Result: Good. Sowed 3,000 square yards with 10 lbs. seed broadcast on dry land. Consider it a suitable stock feed. Can recommend it to be sown on a large scale.

(Mr. J. H. Brink).—Sown December. Result: Good. Sown broadcast on dry land. The second sowing did very well. Can recommend it for a winter feed, but it ought to be sown February-March.

(Mr. R. Lake).—Sown March. Result: Good. Was sown broadcast during dry weather. Is doing better than all the other grasses.

Hanover (Mr. F. O. van der Merwe).—Sown November. Result: Indifferent. The heat killed off many plants, but since autumn it has started to stool, but has not shot up.

Knysna (Mr. H. Toplis).—Sown March. Result: Indifferent. Came up well in spring, but went off in cold, dry weather. Not considered suitable.

Riversdale (Mr. M. J. La Grange).—Sown June. Result: Good. Sown thickly it did remarkably well, growing 18 inches high. Consider it the best grass of all.

Swellendam (Mr. E. Pieterse).—Sown August. Result: Good. Did well sown on irrigated land. Grazed off three months after germination, and is growing well now. Good for cattle and horses.

Wodehouse (Mr. H. T. Sills).—Sown October. Result: Good. Only half the seed germinated, but that did well, notwithstanding drought and frosts. Consider it a good grass.

ITALIAN RYE GRASS (LOLIUM ITALICUM).

This is another popular grass, and farmers are beginning to lay down large paddocks to it. It makes a very good winter grass, and should therefore be sown in early autumn. It stands frost well, and stock of all descriptions are fond of it. It gave excellent results in the North-eastern districts. From eleven reports received two were negative, owing to the seed not germinating for some reason or other, chiefly drought. Including reports already published, this brings the total up to 62, of which 43 were successful.

Cape (Mr. F. J. Noonan).—Sown March. Result: Good. Doing well.

Griqualand East (Mr. E. B. Sheppersen).—Sown November. Result: Good. Doing well, but do not know how it will stand frost. Sown on dry land broadcast.

(Mr. A. R. Sheppersen).—Sown November. Result: Good. Doing very well.

(Mr. J. H. Dodd).—Sown February. Result: Good. Up to July it has done well, but do not know how it will stand the winter.

(Mr. J. H. Malherbe).—Sown February. Result: Indifferent. It grew, but cannot be called a success.

(Mr. E. J. Hawker).—Sown January. Result: Good. Three-quarters of an acre was sown thinly broadcast with 2 lbs. of seed. It was fed all the winter by stock, and is one of the best kinds of grass here.

(Mr. A. G. Hawker).—Sown January. Result: Good. Broadcasted thinly on dry, rich soil it grew well, providing grazing all the winter through. Stock preferred it to wheat, oats, or barley.

(Mr. A. J. T. Ekrow).—Sown January. Result: Good. Sown thickly on dry ground it grew well. The more it was fed down the better it grew.

Paarl (Mr. P. J. Hugo).—Result: Good. It grew well until sheep got into it when it was young, which checked it somewhat. Sown on dry land broadcast.

Devon Evergreen Rye Grass.

This is another variety of rye grass which has found favour with the farmers, and is giving good results. It provides good winter feeding for stock. Of the eight reports received only two were indifferent, one experiment failed through drought and the remaining five reports are good.

Caledon (Mr. C. Faurier).—Sown July. Result: Indifferent. Do not think it will do on Karroo soil, although it was irrigated.

Cathcart (Mr. J. R. Hart).—Sown: No date given. Result: Negative. Failed through drought.

Griqualand East (Mr. E. J. Hulley).—Sown November. Result: Indifferent. Grew well, but was killed by rust.

(Mr. C. H. Bradley).—Sown October. Result: Good. Sown on dry sandy soil broadcast it came off well, producing good winter feed.

(Mr. G. H. Edy).—Sown November. Result: Good. Sown fairly thick on dry, poor soil it grew well. Consider this one of the finest grasses for all-round feeding, and deserving of more extensive cultivation. In the germination, growing, and spreading it leaves nothing to be desired. It being of so fine a texture, consider it a fine grass for sheep, more so than cocksfoot.

Riversdale (Mr. M. J. La Grange).—Sown June. Result: Good. Sown at the rate of 20 lbs. to the acre on dry soil it did well. Ought to be sown earlier.

Sterkstroom (Mr. R. G. Brodie).—Sown March. Result: Good. Sown thickly on manured sandy soil, it is doing excellently. Was irrigated. Very suitable to district.

Tarkastad (Mr. F. E. Leppan).—Sown: No date given. Result: Good. Did not do at first on account of drought, but a small piece which was irrigated did well, withstanding cold and frost.

MANURIAL EXPERIMENTS ON CEREALS.

KNYSNA EXPERIMENT STATION, 1907-09.

By R W. THORNTON, Government Agriculturist.

The following experiments were carried out by Mr. K. Meldal Johnsen, Manager of the Knysna Experiment Station. The soil on which the experiments were conducted on the Experiment Station was, like much of the land found in the Knysna district, of a very sour nature, in addition to which it was virgin soil. Both these factors militated against the accuracy of the experiment. Notwithstanding this, results of a very interesting character were obtained during 1907 and 1908 from the manuring of oats, barley, and rye.

The extent of each plot was a quarter acre in 1908 and one-tenth acre in 1907. The ground used in 1907 was such as had been ploughed the previous year (1906) for the first time, and the same was the case with that used in 1908—that is, the usual practice of "fallowing" took place in 1906 in the one case and 1907 in the other, and the next ploughing was carried out immediately before sowing in the respective years. The nitrate of soda was applied in each case in August, when the young growing crop could make the most use of it.

OATS.

The seed was sown on the 18th May, 1908, at the rate of 100 lbs. to the acre, with a seed drill, subject to manuring the soil with various combinations of artificial fertilisers.

On examining Table I we find that where the normal dressing, 200 lbs. of superphosphate, used in combination with the other manures, was reduced, the yield decreased (compare plots 3 and 7, Table I). Again, where the amount of potash was reduced the crop increased (compare plots 3 and 5, Table I), but, on the other hand, where the application of nitrates was reduced the crop increased accordingly, which is quite at variance with the results of the 1907 experiments (see Table II), where it was found that the extra application of nitrates improved the crop. The kraal manure has shown a decided increase over the control, though still a miserable yield, but as in other experiments conducted this manure has proved all but a financial failure in the first year, but its residual value is remarkable, and the next crop will probably show a heavily increased yield.

Plot.	Manurial Treatment.	Yield in lbs. per acre.	Increase in Crop	Value of Increase @ 3/- per 100 lbs.	Cost of Manures.	Profit.	Loss.
	lbs.		lbs.	£ s. d.	£ s. d.	£ s. d.	£ s. d
1	No manure	52	...	...	...	...	...
2	100 Government Guano 200 Superphosphate ... ... 20 Sulphate of Potash ... 100 Nitrate of Soda	2892	2840	4 5 3	1 6 6	2 18 9	...
3A	200 Superphosphate ... .. 40 Sulphate of Potash ... 80 Nitrate of Soda	2004	1952	2 18 6	1 1 3	1 17 3	...
4	300 Basic Slag ... ... 60 Sulphate of Potash ... 120 Nitrate of Soda	1264	1212	1 16 4	1 8 2	0 8 2	...
5	200 Superphosphate . . ... 20 Sulphate of Potash ... 80 Nitrate of Soda	2196	2144	3 4 4	0 18 9	2 5 7	...
6	200 Superphosphate ... ... 40 Sulphate of Potash ... 40 Nitrate of Soda	2688	2636	3 19 1	0 15 11	3 3 2	...
7A	100 Superphosphate . ... 40 Sulphate of Potash . 80 Nitrate of Soda	1620	1568	2 7 1	0 16 6	1 10 7	...
8	10 tons Farmyard Manure ...	1792	1740	2 12 3	2 10 0	0 2 3	...

In 1907 oats were submitted to a more varied manurial test than in 1908 (see Tables II and III). The average of nine unmanured plots gave a return of 540 lbs. of hay per acre, a much larger return than that of 1908, as was the case with the entire experiment. Yet the results point to the same fact that by reducing the phosphate the crop was also reduced (compare plots 61 and 77). Government guano, on the other hand, being more or less a one-sided manure, *i.e.*, nitrogenous, the addition of a further 100 lbs. to increase the amount of other plant food for the crop all but trebled the yield (compare plots 79 and 99). On plot 62 bush ash was used as a substitute for sulphate of potash, with very good results. The yield decreased slightly, but at the same time the cost was reduced.

TABLE II.

Plot.	Manurial Treatment.	Yield in lbs. per acre.	Increase in Crop.	Value of Increase @ 3/- per 100 lbs.	Cost of Manures.	Profit.	Loss.
	lbs.		lbs.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	Average of unmanured plots ...	540	...	...	...	...	...
61	200 Superphosphate ... ... 40 Sulphate of Potash ... 80 Nitrate of Soda	4550	4010	6 0 3	1 1 3	4 19 0	...
77	100 Superphosphate ... ... 20 Sulphate of Potash ... 40 Nitrate of Soda ... ... 100 Government Guano ...	1800	1260	1 17 9	0 16 7	1 1 2	...
79	200 Government Guano ...	1300	760	1 2 9	0 12 0	0 10 9	...
99	300 Government Guano ...	3865	3325	4 19 9	0 18 0	4 1 9	...
62	200 Superphosphate ... ... 300 Bush Ash ... ... 80 Nitrate of Soda	3220	2680	4 0 5	0 17 0	3 3 5	...

An omission experiment was also carried out with oats in 1907 (see Table III), which clearly shows the reduction in the crop where the phosphates were omitted. The omission of potash, on the other hand, did not materially affect the yield, yet the result obtained was not quite as good as that from the complete manure applied to plot 64, again showing the necessity of using a complete fertiliser (compare plots 64 and 67) The omission of nitrogen, however, reduced the yield by fully 1,000 lbs per acre (compare plot 64 with 66)

TABLE III.

Plot.	Manurial Treatment.	Yield in lbs. per acre.	Increase in Crop.	Value of Increase @ 3s. per 100 lbs.	Cost of Manures.	Profit.	Loss
	lbs.		lbs.	£ s d.	£ s d	£ s. d	£ s d
64	200 Superphosphate 40 Sulphate of Potash ... 80 Nitrate of Soda	4550	4010	6 0 3	1 1 3	4 19 0	
67	200 Superphosphate .. 80 Nitrate of Soda	3940	3500	5 5 0	0 15 4	4 9 8	
66	200 Superphosphate .. .. 40 Sulphate of Potash	3550	3010	4 10 3	0 14 11	3 15 4	.
68	40 Sulphate of Potash 80 Nitrate of Soda ...	1200	660	0 19 9	0 12 3	0 7 6	...
	Average of unmanured plots	540	..			.	

BARLEY

The ground on which barley was sown (at the rate of 80 lbs to the acre) was of the same nature and subjected to the same treatment as that for oats for both years The nature of the ground for the production of a barley crop without the addition of fertilisers can be gauged by the result obtained from the unmanured plot, from which the yield was not even double that of the seed sown, and would not cover the labour and expense of sowing. Although the application of the fertilisers increased the yield by some 600 lbs. in one instance the cost of the manured reduced the profit somewhat; nevertheless, the results are very interesting, as they tend to show that by judicious fertilising barley can be grown at a profit even on poor soil, such as that used at Knysna. We notice in scanning Table IV that the manure applied to plot 2 has increased the total yield, but plot 3 has given a greater percentage of grain This is undoubtedly due to the excess of nitrogen applied to plot 2 in the shape of the additional 100 lbs. of guano, and points to the fact that the nitrate of soda, which is expensive, might be considerably reduced. Comparing plots 6 and 3 we find that an excessive reduction of nitrogen reduces the crop considerably, but more in the straw than in the grain. Again, in comparing plots 3 and 5 we fiund that a reduction of potash reduces in proportion *both* the straw and grain With the superphosphate the reduced application has not proved so disastrous as in the oat experiment (compare plots 3 and 7 of Table IV with the corresponding numbers of Table I)

TABLE IV.

Plot.	Manurial Treatment	Yield in lbs. per acre. Straw	Grain	Incr Crop.	Value of increase @ per 160		Profit.	Loss.
	lbs.			lbs.	£ s d	£ s. d	£ s. d.	£ s. d
1	No Manure	176	136		...			
2	100 Government Guano 200 Superphosphate 20 Sulphate of Potash 100 Nitrate of Soda	1232	701	568	1 12 0	1 6 6	0 5 6	
3	200 Superphosphate 40 Sulphate of Potash 80 Nitrate of Soda	1072	748	612	1 14 5	1 1 3	0 13 2	
4	300 Basic Slag . . 60 Sulphate of Potash 120 Nitrate of Soda	860	592	456	1 8 6	1 8 2	0 0 4	
5	200 Superphosphate 20 Sulphate of Potash 80 Nitrate of Soda .	696	450	314	0 19 11	0 18 9	0 1 2	
6	200 Superphosphate 40 Sulphate of Potash 40 Nitrate of Soda ...	764	644	508	1 8 7	0 15 11	0 12 8	
7	100 Superphosphate 40 Sulphate of Potash 80 Nitrate of Soda	904	612	476	1 6 8	0 16 6	0 10 2	
8	10 tons Farmyard Manure	720	580	444	1 5 0	2 10 0	..	1 5 0

Turning now to the series of experiments conducted on barley in 1907 we find that the average total yield of both the unmanured and manured plots was greater than for 1908 For details see Table V. In looking at this table it will be noticed that plot 141 received the same dressing as plot 3 in Table IV in 1908, yet the return per acre in 1907 was more than four times as great as that received in 1908, though the treatment was the same This goes to prove how the soil will vary on the same farm and also the effect of a good season, yet the proportion of grain to straw was better in 1908 than in 1907.

TABLE V

Plot.	Manurial Treatment.	Yield in lbs per acre Straw.	Grain.	Increase in Crop.	Value of Increase (@ 9 - per 160 lbs.	Cost of Manures.	Profit.	Loss.
	lbs			lbs.	£ s. d	£ s d	£ s d.	£ s d.
141	200 Superphosphate ... 40 Sulphate of Potash . 80 Nitrate of Soda ...	2470	1620	1524	4 5 8	1 1 3	3 4 5	..
142	100 Superphosphate 20 Sulphate of Potash 40 Nitrate of Soda 100 Government Guano	1550	930	834	2 6 11	0 16 7	1 10 4	.
159	200 Government Guano	1960	1110	1044	2 18 8	0 12 0	2 6 8	...
	Average of unmanured plots	237	96	...	..	..	...	...

As with oats, an omission experiment was carried out with barley in 1907 (see Table VI). In this experiment one or other of the plant foods was omitted in each case, and from the tabulated results it will be clearly seen that by this omission the yield was much reduced (compare the result obtained from plot 144, which received a complete manure, with any of

the other plots). As in the case of the oat experiment, the omission of phosphates proved most detrimental (compare plots 147 and 146 with plot 148), but in no case was the yield obtained half as great as that obtained from the complete manure, which is also the manure that will not exhaust the soil

TABLE VI.

Plot.	Manurial Treatment.	Yield in lbs per acre. Straw.	Grain.	Increase in Crop.	Value of Increase @ 9 per 160 lbs.	Cost of Manures.	Profit.	Loss.
	lbs.			lbs.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
144	200 Superphosphate 40 Sulphate of Potash 80 Nitrate of Soda	2470	1620	1524	4 5 8	1 1 3	3 4 5	
147	200 Superphosphate 80 Nitrate of Soda		275	179	0 10 1	0 15 4		0 5 3
146	200 Superphosphate 40 Sulphate of Potash		230	134	0 8 0	0 14 11		0 6 3
148	40 Sulphate of Potash 80 Nitrate of Soda	100	80	No increase	.	0 12 3		0 12 3
	Average of unmanured plots							

RYE.

It is not the usual practice on farms to study the manuring of rye, as it is generally sown as the last crop and on land that will not produce a good crop of any other cereal, but in 1907 a test was made at Knysna, with the result that the value of manuring is clearly shown (for details of this experiment see Table VII). The control plot yielded an average of 6 lbs. grain and 17 lbs. straw, as against a yield of 392 lbs. grain and 1,458 lbs. straw from the best manured plot. Government guano at the rate of 200 lbs. to the acre proved one of the best manures (see plot 19).

With rye, as with barley and oats, the application of phosphate had a marked effect, and where phosphates were omitted the yield obtained was only nominal (see plot 7), yet the application of both potash and nitrogen is essential, as is shown by the result obtained from plot 2, and also by the decreased yield obtained from plots 4 and 5, where nitrogen was omitted in the one case and potash in the other. As was to be expected, however, the addition of nitrogen proved more beneficial than the addition of potash (compare plots 4 and 5).

TABLE VII.

Plot.	Manurial Treatment	Yield in lbs. per acre. Straw.	Grain.	Increase Crop.	Value of Increase @ 7/6 per 100 lbs.	Cost of Manures.	Profit.	Loss.
	lbs.			lbs.	£ s. d.	£ s. d	£ s. d.	£ s. d.
1	Average of unmanured plots	17	6	...	...	...	...	...
2	200 Superphosphate ... 40 Sulphate of Potash . 80 Nitrate of Soda ...	1298	302	296	1 2 2	1 1 3	0 0 11	...
4	200 Superphosphate ... 80 Nitrate of Soda .. 200 Superphosphate ..	1458	392	386	1 8 10	0 15 4	0 13 6	...
5	200 Superphosphate ... 40 Sulphate of Potash ...	847	218	212	0 15 11	0 14 11	0 1 0	...
7	40 Sulphate of Potash ... 80 Nitrate of Soda ...	30	10	4	0 0 4	0 12 3	...	0 11 11
19	200 Government Guano ...	712	288	282	1 1 2	0 12 0	0 9 2	...

A further experiment with rye was carried out (see Table VIII). In this experiment the manures applied were the same as those applied to plots 2, 4, 5, and 7 of Table VII, but the quantity applied in each case was doubled. With the exception of one plot, the increased yield obtained was not sufficient to cover the extra outlay on manures, which proved that the maximum payable application had been exceeded. On plot 2 the total yield was increased by 95 lbs ; 92 lbs. of this was grain. Again, from plot 4 the total yield was increased by 130 lbs., but the grain was only increased by 85 lbs., a smaller percentage than plot 2. From plot 5 we find that the total yield was increased by 342 lbs., and the grain increased by 135 lbs, whereas from plot 7 the increase was only 10 lbs. of grain and a total increase of 37 lbs. The results are as follows:—

TABLE VIII.

Plot.	Manurial Treatment.	Yield in lbs. per acre. Straw.	Grain.	Increase in Crop.	Value of Increase @ 7/6 per 100 lbs.	Cost of Manures	Profit.	Loss.
	lbs.			lbs.	£ s. d.	£ s. d.	£ s d.	£ s. d.
	Average of unmanured plots	7	6	...	...	...	..	..
2	400 Superphosphate 80 Sulphate of Potash 160 Nitrate of Soda	1295	400	394	1 8 10	2 2 6	...	0 13 8
4	400 Superphosphate 160 Nitrate of Soda	1502	478	472	1 15 5	1 10 8	0 4 9	
5	400 Superphosphate 80 Sulphate of Potash	1054	353	317	1 6 0	1 9 10	.	0 3 10
7	80 Sulphate of Potash 160 Nitrate of Soda	68	20	14	0 1 0	1 4 6		1 3 6

From the results of the foregoing experiments, the following conclusions have been arrived at:—

(1) That the application of phosphates to the soil is most beneficial to the crop, and if omitted the crop is practically a failure. This was to be expected, as most soils in the Colony are deficient in phosphates.

(2) That although the nitrate or potash may be omitted, yet the addition of one or both materially increases the crop, at the same time militating against the wearing out, *i.e.*, the impoverishing of the soil, which impoverishing has so reduced the yield per acre in certain parts of the Colony.

(3) That an excess of nitrogen if applied to barley tends to increase the weight of straw, to the detriment of the grain, whereas oats being taken as oathay, the difference is not, unfortunately, noticed to the same extent

BECHUANALAND FROM THE IRRIGATION STANDPOINT.

A RECONNAISSANCE SURVEY.

By F. E. KANTHACK, A.M.I.C.E., Director of Irrigation

(Continued from page 284.)

WATER BORING EXPERIENCES.

(20) The experiences in connection with water boring on the block of new farms laid out in the Second Railway Grant, adjoining the Genesa Native Reserve are of very great interest.

Particulars of the boring operations are given in the attached table from which it appears that out of 3 holes sunk on 21 farms only 14 holes produced a supply of water. It will be noticed also that the water bearing capacity of the farms diminishes from east to west, those along the Genesa-Morokwen road being nearly all barren.

This absence of water on these farms is somewhat discouraging, as surface conditions were distinctly favourable. And some remarks by Mr. H. M. Oakley, who was in charge of the operations, when reporting to the Public Works Department upon his operations, are of interest.

Speaking of the farm "Crafthole" he writes:—

Owing to an opinion which is very general in Bechuanaland that water could always be struck by what are known as "Aars," viz., a well defined line of bushes called "water bushes," we decided to test the value of the theory and selected a site possessing all the alleged necessary surface conditions with the result that no water was obtained.

After failure in the third hole on Aintree, I determined to try a fourth hole on the "Bult" of the same farm at a spot where water is much required by the travelling public, and where, if there is anything in the theory that on the farms in the Western portion of the Railway Grant water would be more likely to be found on the bults, we should have struck it.

* * * * *

From the experience gained, I am convinced that the underground water does not, as was supposed, flow along the laagtes, except perhaps in the Thlakgaming Laagte where the granite is more uniformly decomposed to a greater depth.

To the Westward—the watershed—the granite is hard nearer the surface and outcrops are more frequent and reveal a distinct North-Westerly and South-Westerly strike. It is along this strike where the rock is decomposed and creviced in narrow belts, that I am of opinion that the water flows. Having its source to the westward it travels in a North-Westerly and South-Easterly direction, increasing in volume in its course, until it reaches the more Easterly laagtes down which some escapes, but the greater quantity continuing on along the general strike of the formation. The difficulty is to locate these decomposed and creviced belts. The deposits of Calcareous Tufa are believed to be an indication, but as will be seen from the Sections, in some instances we have gone through thirty feet of it. In the vegetation I have also sought

for guidance but have been disappointed and in sheer desperation the aid of the divining rod has also been invoked, but that popular medium proved itself again to be a base deceiver, indicating water where none existed notwithstanding that all other features were favourable to it.

Apart from the boring operations on the Western Second Railway Grant, these have been mainly confined to the more eastern portions of the country. Near the town of Mafeking these operations have been very successful, water being struck in considerable quantity at comparatively small depths To work a drill water and fuel are essential, and though the latter can generally be obtained in any quantity, the supply of water sometimes presents very great difficulties. Farms are very large, and many are without water and unoccupied, and a farmer desirous of boring may find himself many miles from the nearest supply, which he will require for man, beast, and the engine. These adverse conditions do not attract contractors to the country, and make boring with Government drills expensive in outlying districts unless carried out on an extensive scale. In consequence, many farmers have confined themselves to well sinking with varying success, many having abandoned their farms after their first failure.

Over the greater part of Bechuanaland, hard rock is seldom traversed in boring or well sinking operations. Sinking is carried through the surface deposits of sandy soil and calcareous tufa into the decayed granite or gneiss, and when the hard bed rock is reached, experience has shown that it is futile to continue. Sometimes thin layers of sound granite are found floating in the soft decayed rock, and such a layer would probably cause a drill foreman to suspend operations. Thus on the farm Chwabe, on the Thlakgaming laagte, a well was sunk 114 feet deep, down to the true bed rock, but within the decomposed granite two layers of hard granite, each a few inches thick, were cut through. When well sinking in calcaerous tufa or in decomposed granite, no blasting is necessary. Drilling is done with percussion and diamond drills, but lately much successful boring has been done with a steel rotary cutter.

(21) Excluding the boring done by Government recently on the Western Railway Grant, records of Government and contractors subsidised drilling operations supplied to me by the Public Works Department show the following results from the year 1904 to the end of 1907.

Division	Total Boring Operations		Holes abandoned.		Holes yielding Water.		Yield according to list in gallons per 24 hours.
	No. of Holes.	Footage Drilled.	Number.	Footage.	Number.	Footage.	
Mafeking	97	9,891	32	2,821	65	7,070	2,090,260
Vryburg	36	2,795	14	965	22	1,830	355,060
Taungs and Pokwani	21	1,956	6	6	15	1,674	255,850

From the above data the following averages are obtained:

District.	Average depth of successful hole.	Average yield per hole in gallons per 24 hours.
Mafeking	109	32,158
Vryburg	83	16,139
Taungs and Pokwani	112	17,057

The following is an analysis of the depth drilled:—

District.	Less than 100 feet.	100' to 200'.	200 to 300'.	300' to 400'.	400 to 500'.
Mafeking	31	29	1	1	1
Vryburg	14	9			...
Taungs and Pokwani	5	10			...

The deepest successful bore was on Mr. J. W. de Kock's farm Boschkop, in the Division of Mafeking, viz , 447 feet, yielding only 3,000 gallons per day.

A hole 305 feet deep, and yielding 7,200 gallons per 24 hours, was put down by the Madibi Gold Mines, Ltd. The deepest unsuccessful bore hole was drilled on the farm Zwartlaagte, belonging to Mr. J. W. de Kock, M.L.A., also in the Division of Mafeking, and was abandoned at a depth of 343 feet.

The deepest well was sunk on the farm Pipani, near Morokweu, which was taken down 340 feet, only a nominal supply being obtained. On the same estate five other wells were sunk, yielding good water at depths varying from 40 to 135 feet.

(22) From the foregoing it will be seen that boring and well sinking for water is a troublesome, uncertain and expensive proceeding.

Though the rainfall is considerable and the surface drainage insignificant, it does not follow that the entire precipitation goes to swell the underground stores of water. On the Kaap plateau great quantities no doubt soak deep into the ground through fissures, some of which issue in the form of strong springs from the numerous " eyes " which are characteristic of the dolomite area. Vast quantities no doubt soak away to great depths, and may give rise to available underground water at great distances from the source of supply. On the Sandveld of the granitic area and overlaying the western portion of the dolomite area, the rainfall is readily absorbed by the porous sandy soil. It falls, however, during the hot summer months, and a very large percentage will be lost by surface evaporation. Of the remainder a large proportion will be held in the pores of the coarse, sandy soil by capillary attraction, and will be drawn up by the roots of grasses, shrubs, and trees, and returned to the atmosphere by transpiration, only a very small portion being likely to reach the permanent water table. The heavy growth of vegetation on the sand veld which after months of winter drought sprouts in the spring shows clearly enough that much moisture is held in suspension in the soil, and, as I will show later, I think this condition of things is one of Bechuanaland's greatest assets. A permanent supply of water is, however, essential for stock farming in Bechuanaland, and though geological conditions and surface indications may often prove misleading, there can be little doubt that on most farms water can be obtained by boring or well sinking, and one or two failures should not dishearten a farmer too much.

AGRICULTURAL CONDITIONS.

(23) In the following paragraphs I have set forth my ideas on the agricultural and stock farming conditions and possibilities of Bechuanaland. In dealing with these matters I have gone to a considerable extent out of my own particular sphere of work as an Irrigation Engineer. I

have done my best to draw certain reliable conclusions from a vast amount of information which I accumulated during my travels in and out of Bechuanaland. My informants were very numerous, and many of them men who had for many years battled against the troubles and vicissitudes of a new country and successfully overcome all obstacles. I am not fully competent to write with authority on stock farming matters, but the following notes have been reviewed for me by qualified authorities, and I therefore hope that they will give a general idea of the prevailing conditions and prove useful.

Stock Farming.

(24) *Condition of Veld.* —The nature of the veld is determined largely, if not entirely, by geological conditions, that is to say, the veld in its natural condition. Where mankind has maltreated the natural covering of the ground by long continued burning it assumes a character of its own, which is met with under varying geological conditions. Broadly speaking, there are two distinct kinds of country in Bechuanaland First and by far the best is that overlying what I have called the granitic area lying, roughly, north of a line from Vryburg to Motiton and of the Mashowing River. Second and much inferior to the above is the dolomite veld, coinciding generally with the Kaap plateau. *In the granitic veld* the soil is sandy and of fair depth, and has the property of holding moisture It is underlaid by calcareous tufa and rotten granite, with a combined depth of a hundred feet and more. The country is naturally very thickly wooded, the indigenous trees being chiefly Kameeldoorn, Mimosa, Wacht-een-beetje, Haakdoorn, Witgatdoorn, Yellowwood (local name), and Vaalboom. The trees are sometimes thick enough to form a dense forest, as is the case about 100 miles down the Molopo. Elsewhere the trees are scattered about at fairly close intervals, but not so close as to form a canopy.

The grasses are sweet, and grow sometimes to a great height.

During the long winter drought the grass dies, and towards the end of the season there is often a scarcity of food for the stock. The spring causes a general rejuvenation of the veld, and this takes place to a certain extent even without rain falling, owing to the moisture stored up in the sandy soil.

As a matter of fact, light rain is nearly always received during September, which is sufficient to start the grass growing, and even though very little further rain may be received for some weeks, the growth is generally maintained, and there is little sign of wilting.

On the dolomite of the Kaap plateau the soil is very thin, and over large areas the dolomite is exposed at the surface, with a little scanty soil in the cracks or hollows. Trees and shrubs are found, as a rule, only along Aars or in patches occupied by calcareous tufa, elsewhere the veld is covered with a coarse grass and wild lavender. In the winter all the vegetation dies down, and comes up with the first shower of rain in the spring, but owing to the paucity of soil the grasses, etc., wilt very quickly, and these periods of wilting have been found to correspond with the prevalence of lamziekte.

One of the chief requirements for stock farming in Bechuanaland is a good winter feed which will keep the stock going during the late winter and early spring till the summer rains have established a proper growth.

Grass burning has caused great deterioration of the veld throughout Bechuanaland by encouraging coarser and useless vegetation at the expense of the sweeter and better varieties, and hundreds of square miles have been denuded of tree growth.

Stock.

(25) Bechuanaland is *par excellence* a ranching country, its bad communications, small population, and great distance from markets making any other form of farming enterprise for the present impossible. Eventually it may support a large population, and ranching will slowly give way to mixed stock and agricultural farming, and large mineral discoveries in or near Bechuanaland may give rise to sudden and great changes in this respect. At present the country is in much the same condition as the prairies of Western America half a century ago, and ranching is, with few exceptions, the only mode of farming, especially on the more remote properties.

In its natural state the veld is clothed with tall and somewhat coarse grass, and is suitable for cattle only. After a period of close grazing and tramping by cattle it becomes suitable for small stock. At present, with the vast area of the farms and the comparatively small amount of large stock, the country is not good for small stock; though it is probable that if a farm of moderate dimensions were divided into camps and grazed systematically in rotation sheep of the right class would do well.

Cattle.

(26) There is probably no better cattle country in South Africa than the granitic area of Bechuanaland. Rinderpest and other universal scourges excepted, the country is practically free from cattle disease. Lamziekte is practically unknown, and galziekte is amenable to treatment.

The Bechuanaland veld is wanting in several necessary animal food constituents, and success in stock farming can only be attained if these shortcomings of the natural veld are made up artificially. The deficiency is supplied by "licks" of various kinds. Salt and bonemeal are essential constituents, and different farmers add sulphur, bluestone, molasses, Stockholm tar, paraffin, linseed oil, potash, and other items according to their particular views. Whether all these things are useful or not I cannot say, but they apparently do no harm, considering the large measure of success attained by the farmers using them.

On the Kaap plateau cattle raising is a much more troublesome business, owing to the number of diseases which have to be battled against, particularly "*Lamziekte*," and some parts of this area have a very bad name. It is a mistake to think, however, that cattle raising is here impossible. There are, or more correctly there were, unfortunately, in this area a large number of settlers whose one object in life was to squat in idleness, live in discomfort, and shoot game. They kept a mixed herd of large and small stock of every variety of breed, which lived or died according to chance, but to try and fight disease or to improve their farms and their stock would necessitate work, and perhaps hard work, which is the last thing individuals of this class will tolerate. These so-called farmers would rather see the whole of their stock die of lamziekte than spend a few pounds on bone meal. Then, again, the country has suffered at the hands of the bad farmers or men who have been successful elsewhere starting with preconceived ideas and want of local knowledge. These people have, perhaps, done more harm than the lazy man, as they are fond of writing columns in the daily press on the utter worthlessness of the country after a few weeks or months of failures, generally brought about by their own ignorance.

The dolomite veld is not the same happy and disease-free country as the granite veld, but the hard-working, careful, and intelligent farmer can raise cattle there and do well. The feeding of bone meal in considerable quantities is, however, essential. As the veld is poorer and more liable to suffer from breaks in the rains, it is very important to work the

grazing on the farms systematically, and to grow as much special food as possible, be it mealie stalks, roots, lucerne, or grass hay. Enterprising men who have been for years on the plateau are now successful cattle raisers, and when I inquired into the reasons why one man never lost cattle and his neighbour could not keep any, I always found that the latter was not taking proper precautions.

In an article on Lamziekte on the Kaap plateau in the *Agricultural Journal* of the Cape Colony, May, 1908, by J. Spreull, M.R.C.V.S., who was engaged in a special study of this disease at Koopmansfontein, near Kimberley, he writes as follows:—

There are certain existing causes which seem to play an important role in its production. The disease is met with sporadically all the year round, but its season of greatest prevalence is from September to the end of January, depending in this area very much on the amount of rainfall. Lamziekte is always prevalent in the hottest weather when the rainfall is desultory and insufficient, and cases keep coming on till good rains fall and put the veld in good condition. This year, the rains having almost entirely failed, has brought on a crop of cases in February, whilst last year the good rains of January almost made the disease to cease. All are agreed that lamziekte is most prevalent when the grass shoots up and again withers away under the weather conditions above indicated. In much the same way burnt veld is believed to be very dangerous as a producer of lamziekte, and probably this is because the young grass shooting up without the protection of last year's old tussocks and bush is more prone to wilting than when the veld is not burned. Evaporation from the surface of the soil itself must be greater under such conditions.

Mr. Spreull also draws attention to the danger of infection from water in dams, wells, boreholes, and pans unless the same are protected from all sources of contamination through animal excreta.

After much careful examination and experiment at Koopmansfontein. Mr. Spreull ends by putting his faith in bone meal. He says—

Convinced as I am that the complaint known as Lamziekte is not a bone disease, it seems strange that we should turn to the administration of sterilised bonemeal in the form of a lick as our foremost and best tried means of prevention. As already mentioned, cattle well supplied with this lick scarcely manifest any depravity of appetite but, more remarkable still, do not contract lamziekte in anything like the same proportion of cases, and probably also with less severity when they do.

* * * * *

Bonemeal is evidently a good tonic. Its phosphates are a necessity to the food ration, and should these be proven deficient in the grasses and bush of the varied areas in which the disease abounds, the benefits accruing from its administration will be further explained in the results, which are that the stock are thus kept in a state of exuberant health.

Most breeds of cattle have been tried in turn by progressive cattle ranchers, and frequently experience has been very dearly bought. In some cases large farms were stocked with fine herds of cattle brought up at great expense from other districts hundreds of miles away, only to succumb to numerous diseases. Armed with plenty of ripe experience gained locally, a good farmer will now, no doubt, be able to import a big herd and have few losses, but it is best to build up a herd from animals which have settled down to the local conditions and proved their fitness.

I found that nearly all the best cattle farmers were building up herds with Afrikander cows and Shorthorn bulls. This cross gives a very hardy breed, which stands the vicissitudes of the country well. Frieslands, Jerseys, Herefords, etc., are very inclined to succumb to the hardships of droughts.

Cattle multiply very rapidly in Bechuanaland, and the cows calve at all times of the year, but mainly in the early spring. The animals reach maturity very rapidly, and the cows generally bear calves when too young, causing them to remain stunted in growth and causing deterioration of the breed generally. Young heifers should be kept in separate camps away from the bulls until they are fully developed.

In the spring the calves are very apt to contract dysentery from eating the young green grass, but if promptly treated with castor oil, this should not lead to losses. Much havoc is made amongst the calves by leopards and other large vermin, and precautions must be taken to guard against these depredations.

In most cases cattle are raised for slaughter only, and are brought into Vryburg for sale, whence they are distributed to Johannesburg, Kimberley, and other centres. Dairy farming is carried on to a small extent, and chiefly within a night's trek from the railway, but I think far greater use could be made of the milk in the way of making cheese, tinned butter, etc.

The present somewhat erratic milk supply and the varying condition of the stock could be readily obviated by the growing of winter foods in the shape of root crops, lucerne, etc., and also by mowing the grass on the veld and making hay.

SHEEP.

(27) In its present state Bechuanaland cannot be looked upon as a good country for small stock. The general reason given is that the country is too new. Forty years ago much of the Transvaal could carry no small stock, but after years of tramping and grazing by cattle, sheep do well. In some of the Native Reserves which have carried large herds of cattle for many years sheep appear to do well in small troops. Persians have been tried by many farmers, but always with the same ultimate tragic result. To take a typical example. The Hon. J. J. Keeley, M.L.C., of "Faith," started 16 years ago with 50 Persians, which in 15 years had increased to 1,000, notwithstanding sales of "hamels" and slaughterings for local consumption. The flock then suddenly all died of wire worm. Heavy dosing with bluestone gives temporary relief, but the scourge breaks out again, and soon constant dosing begins to affect the stock. On the Molopo I was informed that so long as sheep ran in small troops they throve, but that as soon as the number exceeded about fifty they suddenly become attacked by wire worm and died.

Persian and Afrikander crosses do somewhat better, but still are badly attacked by wire worm. The Persian strain is extraordinarily prolific. On a farm near Genesa a man started with 277 crossbred Persian and Afrikander ewes and purebred Persian rams in 1904. By April, 1907, he had sold 318 hamels, and slaughtered many on the farm, and had a balance of 615. Crossbred Merinos appear to do fairly well, and suffer less from wire worm.

Mr. Owen, who is managing for Mr. Cullinan at Glenred, near Motiton, considered Namaquas best suited to the country. On this farm crossbred Persians were at the time of my visit dying in numbers from some other intestinal parasite. All this trouble with sheep is due largely to the conditions under which they are kept. Vermin-proof camps are practically unknown in Bechuanaland, and the sheep are consequently kraaled. With the increase in size of the flock risk of contamination increases. Many mistakes are made by new-comers by bringing up unsuitable stock from the Karroo. Only sheep accustomed to grass veld should be imported, and these should be brought up during the winter months only. If brought up in the summer months they are said to get sick and die.

The country is largely infested with large vermin, such as "tigers," rooicats, jackals, wild dogs, etc., and it will be many years before she can be left on the veld. If the sheep follow the cattle on well-tramp and grazed veld they should thrive well enough.

Goats.

(28) What has been said of sheep applies largely to goats; though in general they are better than the sheep. Angoras are not suitable, as they require very much attention, and in most places there is too much thorn bush about. The Boer-Angora cross is said to be the best.

Ostriches.

(29) People often allude to Bechuanaland as the natural home of the ostrich, but the wild bird is met with at rare intervals, and attempts to keep birds in veld camps have been failures. The country is very deficient in brak salts, and the wild birds probably require a very vast area of country to obtain the necessities of life. It is most probable that the small limits of a fenced camp do not provide proper food for the ostrich, and unless this is supplied artificially it cannot exist. With the discovery that lucerne and other crops can be grown without irrigation some farmers are taking up ostrich farming, and if due consideration is given to the birds' dietary requirements, there is every reason to believe that this enterprise will be successful.

(30) Horse-sickness is very bad in Bechuanaland, and the country is, therefore, not suited for horse breeding. In the Kuruman district this disease appears to be particularly bad, and it is said, moreover, that the animals there do not become salted. In the bad season they are there sent up to the mountains.

Donkeys appear to do well, and Mr. McKay, of Pipani, was breeding a good type of animal on a fairly large scale.

(31) From the above notes it will be seen that cattle farming is the only established stock industry in Bechuanaland, and there is a good field for scientific ostrich farming, but the country is not suited for small stock on anything but a minute scale.

Good water is essential on each farm, and at fairly close intervals. In most parts of the country earth dams are useless, owing to the very porous nature of the soil, and, where made, some form of lining is generally necessary. These particulars will be again referred to under "Irrigation." Where dams exist they should be very carefully protected from pollution, all water being led into properly-constructed troughs, and the surroundings of these should be kept drained and clean.

Farms should be, where possible, fenced and divided up into camps, which can be grazed in rotation, and in which the stock can be separated as required. Vermin-proof fencing is very desirable, but until the country fills up this is a luxury which only the rich can afford.

Above all, veld fires should be prevented. The practice is thoroughly bad in every way, causing sickness in stock and great deterioration of the veld and the absolute extermination of trees. It is one thing to stop grass fires on one's own land, but a more difficult matter to keep out fires originating on neighbouring land. This can only be done by ploughing up a belt all round the farm, and keeping the same free from grass and bush, as has been done by Mr. McKay on Pipani, near Moroquen.

The danger of grass fires is especially great on farms adjoining Native Reserves, and great fires sweep across many miles of country, some of them originating in the Bechuanaland Protectorate.

Every stock farmer makes an effort to grow some kind of crop which can be stored for food in winter or in times of drought, as will be shown later. The country is suitable for raising crops of this kind, and it is a matter for surprise that so very little has been done in this direction.

AGRICULTURAL OPERATIONS.

(32) Taking the country as a whole, agricultural operations cannot be profitably carried on, excepting as an adjunct to stock farming, owing to the great distance from markets and the badness of communications, for, with very few exceptions, no proper roads exist, and transport is carried on under considerable difficulties. Even under present conditions, however, a vast amount of agricultural farming could be profitably carried on, as many of the most favoured districts, such as Kuruman, are not always self-supporting, and are dependent upon imported foodstuffs.

The country should be at least self-supporting as regards ordinary grain stuffs, and should produce a sufficient quantity of stock food to maintain a good supply during the winter and during periods of drought. The country lying close to the Railway should be able to produce on a considerably larger scale, as a market exists for surplus production.

Bechuanaland shares with a very few other districts in South Africa the great advantage of being able to raise crops with the ordinary rainfall and without irrigation.

The innumerable wide and shallow laagtes which traverse the whole country are everywhere capable of being turned to good account, and I believe that large areas of high land in the granitic zone will also respond to careful cultivation.

The natives on the Reserve have annually sown and reaped vast areas of mealies and kafir corn, and there are few places where the mealie grows better, but the mealie has never been taken seriously here, or elsewhere, in South Africa. There is money in the mealie, and there are few good crops which respond quicker to scientific farming.

Millets do equally well, and are in great favour amongst the natives, as they provide drink in the shape of beer as well as food, and are less liable to attacks by locusts. Mealies and millets are established crops, but it is only within the last few years that a few men of enterprise have experimented with other crops, notably lucerne.

As the possibility of growing "dry land" lucerne in Bechuanaland is of vast importance to the country I will give a few examples of successful experiments in detail by way of demonstration.

Dry Land Lucerne in Bechuanaland.

(33) Near Mafeking dry land lucerne has been grown experimentally by Mr. J. W. de Kock on his farm Spring Valley, which adjoins the Transvaal boundary. About two-thirds of this farm are high and flat plateau land, consisting of a highly-coloured sandy loam underlaid by diabase and amygdaloid, which is bordered on the south-east by a narrow outcrop of ironstone shales of the black reef series. The remaining third of the farm immediately adjoining the Transvaal is in a laagte, and consists of dolomite and calcareous tufa covered with rich vlei soil. This low-lying land is well watered by springs, which have their origin in the waters issuing from the strong springs on the farms of Mooimeisjesfontein and Grootfontein in the Transvaal, and Mr. De Kock is now preparing to utilise this water for the irrigation of a considerable tract of land. At present he has a large area of this low-lying land under mealies, but he intends establishing lucerne as soon as his irrigation works are complete. On the high land near the homestead a large field of lucerne has been established, which is irrigated from two boreholes by means of two 16-foot Samson wind mills. Close to the boundary of Rooigrond of the Transvaal on a small patch of high and poor looking gravelly ground, Mr. De Kock planted some lucerne in March, 1905. This plot is on one of the highest points of the farm, and gets no drainage water, has received no

artificial irrigation, and has been generally neglected. In spite of this the lucerne has managed to establish itself and though intentionally neglected and weedy, Mr. De Kock has clearly demonstrated that lucerne will grow here without irrigation.

Another and larger area near the homestead on the high ground and consisting of red, sandy loam, was sown to lucerne in January, 1907, and, receiving no irrigation whatever, has become well established and looks vigorous and healthy. The area of this plot is approximately 3 acres. Next to it is a field of lucerne irrigated from the boreholes and, curiously enough, the irrigated lucerne was, at the time of my inspection inferior to the unirrigated lucerne.

The rainfall during the past three years at Mafeking Gaol was as follows:—

1905	22·94 inches.
1906	22·73 ,,
1907	24·65 ,,

Unirrigated lucerne should do well in the low lands. It should not, however, be planted in the valley bottoms, but some distance above so as to obviate water logging. Mr. De Kock recently reported another patch 400 yards by 30 yards on the high veld, between the homestead and the Mafeking road. It was planted in March, 1907. It was eaten down and kept closely grazed by ostriches till early this year, and at the time he wrote it was looking well and in full flower.

On the farm "West End," on the Maritzani, Mr. Meintjes had established lucerne on the right side of the laagte, both in the vlei bottom soil and in the sandy soil next above, but there was no difference between the two. The seed was sown in the summer of 1906-7, and I saw it in September, 1907, immediately after heavy rain. The lands were troubled with weeds, which were being removed, and it was Mr. Meintjes' intention to harrow and re-sow It was clear, however, that the lucerne was establishing itself.

On the farm "Reitzdale," in the Madiakam laagte, a short distance above its junction with the Thlagaming valley, Mr. Flemmer had successfully established a morgen of lucerne. This patch was not in the lowest portion of the laagte but some distance above on the red, sandy soil. I inspected the crop about three weeks after it had received heavy rain, and the enormous development of the individual plants astonished me. They had all stooled well, and as the seed had been sown very thinly, each plant attained considerable development of stalk. I noticed the tendency to form wood also at Kuruman. The crop should, I think, be sown thicker and cut as soon as the first signs of flowers appear, or kept well grazed down. The seed was sown in February, 1907, immediately after rain, 11 lbs. to the acre. The seed bed had received no special treatment, watermelons having been previously grown on it. The lucerne was wonderfully clear of weeds. Mr. Flemmer was allowing the crop to seed, after which it was his intention to cut it and put the disc harrow over it. The soil is here 5 feet deep with porous calcareous tufa below. A large area of similar land was being prepared for lucerne with a view to ostrich farming.

On Pipani, near Moroquen, Mr. McKay had established a small experimental patch of dry land lucerne which had been sown after rain in December, 1906. The crop looked strong and healthy, and Mr. McKay was about to extend the area.

On "Request" (or "Forest Gate"), near Genesa, Mr. St. Quintin informed me that lucerne had been successfully tried.

At Kuruman I found good lucerne growing under irrigation, but saw no dry land lucerne on the Kaap plateau.

(34) The experiments prove pretty conclusively that in any but an abnormally dry year, lucerne can be readily established, in the granitic area at least, without irrigation. In and out of the laagtes there is a good depth of sandy soil underlain by porous calcareous tufa. The mechanical condition of the soil enables it to hold up a large amount of moisture which, coupled with the depth to which the roots can penetrate and suitable food constituents, makes conditions for dry farming all that could be wished for.

Dry farming must, however, be carried on scientifically. The country is hot in summer, and there are often long periods between the showers. All crops should be sown in drills sufficiently far apart to cultivate in between, and a fine mulch must be created and maintained on the surface to prevent evaporation. The principles of dry farming are now much written about, and Bechuanaland offers one of the best fields for this class of work. From casual experiments made by Mr. Kent, of Kliprani, and Mr. Meintjes, of West End, both in the Mafeking division, it is evident that cotton grows well on dry land. It must, however, be sown very early so as to escape the frost whilst the bolls are forming. Unfortunately labour conditions in Bechuanaland make cotton-growing hopeless.

Rape, roots and other crops should all do well on dry lands.

(35) All winter crops, such as cereals, require irrigation, and can therefore only be grown in the few places where irrigation is possible, and these, unfortunately, are very few and far between. The wheat and oats grown with the help of irrigation at Kuruman, Geluk and in the Mosita valley are hard to beat and show what different parts of the country can do. The same applies to potatoes, tobacco and fruit, which all grow to perfection both on the Kaap plateau and in the granitic area. The excellent orchards at "Faith" (the Hon. J. J. Keeley), "West-End" (Mr. Meintjes), Kuruman (Mission Station) and Geluk (Messrs Abt Bros.) bear striking testimony in this respect. The tobacco on "Faith" and at Kuruman shows clearly that better things could be done here.

In some of the swampy laagtes, paspalum grass should do well, and Mr. De Kock, M.L.A., has already achieved success with this grass at Mafeking.

Bechuanaland's greatest asset is its grass, and much more could be done with it than is at present the case. The uplands are generally very flat, and one or two farmers, notably Mr. D. Abt, of Geluk, found no difficulty in putting the mower over it and making excellent hay. This baled hay finds a ready market, and the price realised justifies its transport over long distances. The general excuse for burning the grass is that the stock cannot keep it down, and it therefore becomes rank, and the young growth in the spring is difficult to get at.

Hay-making, besides being highly profitable, disposes of this difficulty. Vlei grass makes excellent bedding, and I was very much surprised to learn that Mr. Abt, at Geluk, was finding a profitable market for this baled bedding at Cradock.

(36) In the section dealing with the details of my tour I have brought to notice what is being done by various enterprising farmers, and I am merely generalising here. It is evident, however, that the average farmer does not in the least realise the natural possibilities of this country and the want of enterprise in the past is probably due to the great size of the farms which makes it possible for an indifferent stock-farmer to exist without exerting himself. This state of things is bound to lead to general retrogression in farming, and the prospect of living and prospering in idleness has attracted many men ill suited for the life. These are the men who bewail their ill luck or curse the country in the daily press. I am convinced that much smaller farms would lead to better farming.

IRRIGATION

(37) It was for the purpose of making an irrigation reconnaissance survey that the Irrigation Department busied itself with Bechuanaland, and the reader of this report will no doubt wonder when the Irrigation Department will commence justifying its existence so far as Bechuanaland is concerned. The results of my investigations in this report are, however, of a very negative character. Perennial rivers there are none with the exception of the Kuruman River. Floods occur in the upper reaches of the Setlagoli and some of its tributaries, but twenty-five miles west of the railway it is safe to say that flood water does not exist in the rivers, or so spasmodically that works to utilise it would not be justified. Storage works for surface flow are, except in the Mosita laagte, impossible owing to the extreme porosity of the soil and the inability to obtain impervious foundations. I have already indicated under the headings "Run-off" and "Underground Water," what the surface conditions of the country are. With a rainfall of over 20 inches and no run-off whatever, it is not surprising if storage works for conserving floodwater are impossible. In the detailed description of the valleys and laagtes, further on, I have clearly shown, I think, by examples of failures, and descriptions of the soil and geological conditions, that dam-building across these laagtes for storage of floodwater is a useless expenditure of money. The sites where such works are possible are so few in number that I strongly advise farmers not to commit themselves to any expenditure on such works without first obtaining advice or consulting local men who have had experience in these matters.

In some of the laagtes there is a thin layer of fairly impervious loam on or near the surface, and if advantage is to be taken of such conditions, great care must be exercised to insure that the whole of the submerged area will be completely covered by this layer and not pierced in any place. On no account should this material lying inside the dam be used for constructing the dam as was done in the example quoted from the Thlakgaming laagte in paragraph 79.

(38) The Mosita Valley, fully described in paragraphs 67—73, is the only one I know of which, owing to its geological formation is suitable for storage works, but there are already twice as many dams as there is water for, and no scope for further enterprise. A foundation of solid rock, outcrops of which occasionally occur across the laagtes, is the only possible one to build on in Bechuanaland, and even then care must be taken to make sure that the rock barrier is sound and free from pockets of disintegrated rock and tufa.

These outcrops of granite are frequent on many of the laagtes in the granitic area such as the Maritsani, Setlagoli and Mashowing, and where these occur, especially in such portions of the river courses in which flow is frequent, low masonry weirs which will effectually cut off all the sub-surface flow may prove serviceable as small storage dams, in combination with pumping machinery.

In these rivers there is a considerable sub-surface flow which can be generally tapped by digging shallow pits. Where rock can be struck at moderate depth, sub-surface dams or masonry or concrete wall built across the valley down to rock foundations, but not protruding above the bed of the laagte, should prove useful. Such dams are constructed by excavating a trench across the laagte with abutments and foundation extending to bed rock. The trench is then filled with good concrete. Where such walls are taken down to a considerable depth, gathering wells must be provided in the line of the wall and drain pipes laid above the same with open joints and through the wall into the wells. A very large dam of this type has been built in California with a maximum depth of 52 feet. Such works would be of great use on many farms for stock purposes.

On the Maritzani, the river could be turned out in one or two places by means of small weirs on granite outcrops, from which a certain amount of low land adjoining the river could be flooded.

(39) Irrigation by pumping can only be carried on on a small scale in places where there is good supply of water at a small depth below the surface of the land to be irrigated. Such lift irrigation can be profitably carried on near Rooigrond, see para. 48, and at Geluk and Putpan, see para. 108, and in connection with submerged dams as alluded to in the last paragraph. In these cases large wind or even power pumps could be used with advantage.

(40) Pumping for irrigation from boreholes is very seldom feasible unless the diameter of the hole is large enough to introduce a big cylinder and the supply is exceptionally good. In some cases a small supply from a borehole is useful to assist in establishing lucerne, which can manage for itself after the first growing season In general, boreholes yield only enough water to provide for the stock, domestic and kitchen garden requirements.

(41) The borehole or well and windmill are essential on almost every Bechuanaland farm in the granitic area, and also on many farms not favoured with a natural spring on the Kaap plateau. These boreholes or wells are generally very deep, the supply is scanty, and the quantity lifted depends upon the wind. A storage tank is a necessary adjunct to a windmill, and considering the great value of the water lifted, no money should be stinted on storage works of this kind. To pump a weak supply of water a hundred feet or more into a shallow earthen dam is a grossly wasteful procedure. In ninety-nine cases out of a hundred such a dam made of, and in, average Bechuanaland soil will leak like a sieve, and what does not leak away evaporates.

Where clay is available, earth dams can be lined with it and puddled by means of cattle being made to tramp it, but if a watertight dam can be thus made it should be moderately deep compared with the area of water surface, as the shallower the dam the greater will be the loss by evaporation. As stated elsewhere, stock should never be allowed to walk into the water to drink as they will pollute it, and a reservoir of this kind is a most common source of infection. Water should be led out of the dam into drinking troughs.

If a thoroughly efficient lined earth tank is required, Callender's Bitumen Sheeting is one of the best media. Tanks lined with this material are now being largely used on the Rand Gold Fields for cooling ponds and cyanide tanks. The sheeting is laid on a prepared slope by a special process by which the entire lining or bed and sides forms one continuous surface. The sheeting is then covered with a layer of earth and this again with stone pitching. The whole work is done by the Johannesburg agents, Messrs. J. & R. Niven, and the prices for complete dams under normal conditions are quoted below. In outlying districts these prices would probably be exceeded.

Capacity (gallons).	Size of bottom.	Depth.	Slope of walls inside.	Slope of walls outside.	Price £.
110,000	36′ x 36′	6′	3 to 1	1½ to 1	£330
200,000	55′ x 55′	6′	3 to 1	1½ to 1	£550
252,000	64′ x 64′	6′	3 to 1	1½ to 1	£632
505,000	98′ x 98′	6′	3 to 1	1½ to 1	£1,100
1,008,000	146′ x 146′	6′	3 to 1	1½ to 1	£1,925

Where possible, masonry or concrete tanks should be made. When suitable building stone is available a strong masonry tank is the simplest to build. The surface soil should be removed before the floor is laid down, and every precaution taken to obtain a thoroughly stable foundation, otherwise unequal settlement and cracks, especially near the corners of a square tank, are very likely to occur. The masonry must be of the best quality, and all joints thoroughly grouted with mortar. The whole interior of the tank should be lined with cement plaster.

Where building material is scarce and the site far removed from the railway, a reinforced concrete tank would be the most economical and efficient. A properly designed circular tank of this description would take the maximum amount of material, but would be required to be constructed by a contractor thoroughly acquainted with this type of work. At a small additional expense a reinforced concrete tank can be covered in.

Where only a very small quantity of water is to be stored, galvanised iron drums are often used, but these should be open to inspection as they are liable to become very foul inside.

(42) Most irrigation in Bechuanaland is and will be done on the Kaap plateau from the numerous strong springs issuing from the dolomite. Elsewhere I have dealt fully with irrigation at Kuruman, at Geluk and Putpan, at Grootefontein and other places on the Kaap plateau and also at Rooigrond, near Mafeking, which is also irrigable from water issuing from the dolomite in the Transvaal, and I need add nothing further here.

There are very many small springs all over the Kaap plateau which are used for irrigation on a small scale, but methods are generally crude and wasteful, and the areas irrigated are very small compared with what they should be. The spring water is generally led out too far from its source with the result that most of it is dissipated in large swamps or vleis. The state of things depicted on a large scale at Kuruman, Geluk and Molopo exists on a small scale at nearly every spring in the country, and the cure prescribed for Kuruman must be applied to all. That is the water must be captured as close as possible to the eye of the fountain and led away from the bed of the laagte as quickly as possible on to higher ground. The bed of the laagte, which is in every case a swamp, should be drained and reclaimed for cultivation.

(To be continued.)

THE PRODUCTION OF OSTRICH FEATHERS

PROPOSED REGULATION OF THE OUTPUT

(Resolutions submitted to a Congress of Ostrich Farmers and others, held at Port Elizabeth on 1st September, 1909.)

Towards the close of the proceedings on the first day of the Congress, the following resolutions were proposed, seconded and carried:—

1. Proposed by Mr. H. Abrahamson:—That all the resolutions submitted be sent as suggestions to all the Farmers' Associations and the Ostrich Feather Section of the Stud Book for their discussion and consideration. Further, that the Farmers' Associations be advised that Professor Duerden and Mr. Thornton have been requested, and have agreed, to compile the proceedings of this Congress into pamphlet form for publication and distribution, first in the *Agricultural Journal*, and second as an extra pamphlet.

2. Proposed by Mr. W. Rubidge:—That the subject of caponising ostriches be recommended for discussion to the various Farmers' Associations, and that all data in connection therewith be handed to Professor Duerden for inclusion in a pamphlet.

3. Proposed by Mr. Adams:—That Government be approached to ask the Cape Veterinary Department to supply all the data in its possession in regard to caponising.

It is in conformity with these resolutions that the following account has been prepared for circulation among Farmers' Associations and others for their discussion. This is not intended to be a detailed account of the proceedings of the Congress but merely to summarise the resolutions and discussion advanced as regards the regulation of the output of ostrich feathers. The data for the report on caponising have not yet been collected, and will be reserved for a later contribution.

INTRODUCTION.

The highly remunerative character of Ostrich Farming in Cape Colony within the past few years has naturally resulted in an enormous extension of the industry; and at no period has the extension been more marked than at the present time. Not only are more and more districts of the Cape Colony taking up ostrich farming but the neighbouring Colonies of Natal and the Transvaal and also British East Africa are making strenuous efforts in the same direction. The number of ostriches is increasing rapidly in various parts of the United States, particularly in Arizona and California, while other places, such as South America, New Zealand, Australia, Madagascar, the South of France and Germany, are moving in the same direction.

With all this increase in the number of ostriches and in the quantity of feathers produced, the fear arises that the supply may in time exceed the demand, and perhaps result in such a fall of prices as to render the industry no longer profitable. Hence the wisdom of discussing in advance the question of over-production, or the possibility of regulating the supply according to the demand

At the outset it is satisfactory to note that notwithstanding the greatly increased output within the past few years, there is at the present moment no indication that the supply is exceeding the demand; all feathers offered are sold at good prices, and both the local and London markets are firm. Yet the London buyers inform us that an overproduction of common feathers is likely to have a detrimental effect on the trade. With the rapid extension of the industry now in progress it would, however, be contrary to all commercial experience to assume that this condition can be maintained with an article of such limited application as ostrich feathers, unless, indeed, a corresponding extension of usage can be brought about. With the increased production there has hitherto gone hand in hand an extension in the adoption of ostrich feathers as articles of personal decoration. Particularly is this the case on the continents of Europe and America. When curled, the gracefulness and delicacy of the ostrich feather renders it particularly acceptable as a means of decoration, particularly when it is remembered that the clipping of the feathers involves no greater hardship to the bird than the cutting of one's hair or the trimming of the nails.

The problem of over-production can be approached from two very different points of view; either the increasing supply will have to be curtailed to the present demand, or the demand will have to be extended to meet an increasing supply. At the Congress only the first aspect was discussed, namely, the means for limiting the supply or prevention of over-production; it is obvious, however, that the solution of the difficulty may just as readily lie in the other direction, namely, in increasing the demand. Attention will be first given to the suggestions which were made for limiting the supply, and then a few thoughts presented as to increasing the demand.

A.—Reduction in the Quantity of Short Feathers to be Plucked.

This remedy against over-production was introduced by Mr. H. J. Raubenheimer, M.L.A., who said that the amount of short feathers plucked was one of the most tender points in the feather industry. In over-production the ostrich farmer was working against his own interests, and that if present conditions were continued much longer the feather industry would be in the same state as was the wool trade some time ago. Farmers were ruining the industry in a two-fold manner: first, by plucking from the bird short feathers which ought never to be touched, and, second, by offering for sale feathers of a defective and inferior quality It had been suggested that one way out of the difficulty was for every farmer to kill a certain number of his inferior birds each year; but this was not satisfactory. Again, it had been suggested that Parliament should levy a tax on birds, but he conceived it a bad principle to tax Colonial products. He himself would like to suggest another method, namely, the introduction of legislation to prohibit a farmer from removing more than a certain proportion of feathers from his birds. In this way the output of short stuff would be curtailed. He moved:—

"*That this Congress petition Parliament to introduce legislation to prohibit farmers from cutting more than the tails and whites and two rows above the whites from the wings of their birds, a bigger cutting being injurious to the industry, and that the Farmers' Associations be supplied with copies of this resolution for their acceptance or rejection.*"

The resolution having been seconded, Mr. P. Weyer spoke against it, pointing out that it would be unworkable on account of stock thieves. Thieves might come and pluck a man's birds of almost every feather, and the farmer would have to pay the penalty for contravening the law. On the other hand, Mr. Rubidge did not think it would meet the difficulty, because an ostrich farmer of any standing never over-plucked a bird, and, therefore, such a law would not have much effect upon over-production.

Mr. Baker was in full sympathy with the resolution, but he thought it would be impossible to get such a resolution passed, for it would necessitate an army of police to travel round the country and enforce the law.

B.—Tax on all Short Stuff.

Mr. W. Rubidge proposed as an amendment:—

"*That Government be approached to put a tax on all short stuff (the minimum length escaping the tax to be subsequently fixed); Farmers' Associations first being approached for their approval of this method.*"

Discussing the resolution, Mr. Rubidge said he could see only one way out of the difficulty and that was to put a tax on all short stuff, that is, shorter than a certain fixed length to be determined; the tax would be such as to make short feathers not worth plucking. He was afraid the suggestion to prevent indiscriminate breeding was too drastic a measure.

C.—Export Tax on all Feathers to be Devoted to Buying and Destroying Inferior Feathers.

Mr. F. W. Baker (Willowmore) offered the following resolution —

"*That this meeting of dealers, brokers, and farmers having in view the serious crisis threatening the ostrich feather industry on account of overproduction, resolves that the Government be petitioned to impose an export tax of 1s. per pound on all feathers, and that such tax, after the expenses of collecting it are paid, be devoted to the purchase of common feathers, and that these be burnt as soon as bought.*"

He estimated that the man who paid proper attention to his birds would reap £2,000 a year from 300 ostriches, whereas the man who neglected his birds would only get about £400 from the same number. The fault of inferior feathers lay with the farmer and not with the ostrich. The farmer was the greatest culprit, and the drought next. He estimated that his proposed income tax would produce £40,000 a year. The expenses would be limited probably to £5,000, and this would leave a balance of £35,000 to be devoted to the purchase and destruction of common feathers.

One result of such a tax would be that a farmer would not send feathers to market worth less than 1/- per pound, as he would have to pay 1/- tax upon them. He estimated that the annual production of feathers would be decreased from 627,000 lbs. to 500,000 lbs., thus assuring the yearly destruction of about 127,000 lbs. of feathers. It was surely reasonable to expect that if the supply were curtailed to this extent the market would rise proportionately, and he thought they might anticipate an automatic rise of 5 per cent. all round.

The Chairman (Mr. C. Gardner) asked how the spirit of speculation in feathers could be removed under such a system. Mr. Baker replied that the Government would appoint a man to carry out the Act. The official would go into the market, and with a certain sum at his disposal would buy inferior feathers at a low price. If, for speculative purposes, a buyer wanted to pay more, he should be allowed to do so.

D.—A Grading Tax on Inferior Feathers.

Mr Thornton suggested the following for discussion in connection with the taxation of feathers:—

"*That a tax should be put on feathers ranging from the very worst feathers up to a certain standard which they might term 'a possible feather' The standard to be made by the farmers themselves; or by their Associations.*" The standard would be low at first, and the tax would be higher on the very worst feathers, and then as the production of bad feathers decreased, this tax would gradually kill itself because as the feathers improved they would all come up to the particular standard laid down; and the tax would die a natural death, when the standard was reached all over the country. It would mean that they would have feathers examined and reported upon, the expense incurred being covered by the tax itself. When the feathers reached the standard, the tax would lapse and so would the necessity for the examiners. He threw out the suggestion for what it was worth.

Mr. L. J. Roberts could not support any of the proposals before the meeting. They were not the only feather-producing country, and they had to be careful what they did, not play into the hands of the other feather-producing countries. At the present time they were producing a better class feather, and commanding a better market. The production of poor stuff would eventually settle itself, because if the receipts did not balance the expenditure it would stop the production. Farmers were producing the best stuff they could, while there were other poor farmers who could not afford to buy better birds, and if they taxed them it would be a very great hardship. For these reasons he would oppose all the resolutions put forward.

E.—Prohibition of Sale of Inferior Feathers.

Mr. W. F. Painter moved the following resolution as a remedy for over-production:—

"*That this meeting is of opinion that the best way to prevent over-production is to prohibit at public markets throughout the country the sale of feathers which are not worth 5s. per lb. for short stuff and £1 per lb. for wings, that is whites and feminas; and that any feathers of this description sent down to merchants or others for sale should be returned to consignors.*"

F.—Close Season for Breeding.

Mr. A. H. Brooks, M.L.A., without submitting a resolution, introduced the subject of a close season for the breeding of ostriches as a remedy against over-production. In doing this he prefaced his remarks by saying that he was not a farmer, but he was keenly interested in the feather industry, both from a personal and a national point of view. He desired to remind Mr. Raubenheimer that there was little fear of those on the other side turning their back on them, for in South Africa they had the feather trade of the world practically in their hands. What they wanted to get at was this: were they producing more than could be consumed? When they had made up their minds on that point then they could think of reducing the production. There was only one way of reducing the output, and that was by reducing the number of birds. There was no getting away from that fact, and if they wished to limit the output they must be prepared to recognise this essential from the beginning. Let them then give up breeding for two or three years, and so reinstate

the industry on a sound footing. He was convinced that a close season was the only way to deal with the matter. It was useless to talk about legislating against over-plucking or taxing short stuff because every feather taken from a bird to-day found a sale on the other side, and to restrict the sale of any one class of feather would be to seriously hamper the market, and perhaps to cripple the industry.

Continuing the discussion at a later stage, Mr. Brooks again said that if the resolutions proposed by Mr. Raubenheimer were accepted they would be defeating their own ends. It would hamper the trade to an enormous extent if they were going to produce only wings and long blacks and drabs, not only now but for the future. He advocated as the only solution of the difficulty of over-production to have a close season for breeding; and as conditions improved they could remove the restrictions again. They had only to take the production of chicks this season, which was abnormally great, and if this went on it would be a very serious matter. He maintained that if they passed a resolution for a close season for one, two, or three years, whatever the farmers might lose upon the sale of their chicks would be more than made up by the sale of their feathers. There was never a law passed but was hard on someone, and although the lines he suggested might affect them adversely for a time, it would eventually lead to the benefit of the industry generally.

G.—Government to Instruct on Dangers of Over-production of Inferior Feathers.

Mr. Claude Southey proposed the following resolution, which was seconded and duly carried:—

"*That Government be asked to circularise farmers in the feather-producing districts, through Magistrates, Farmers' Associations, and Agricultural Societies, pointing out the danger of over-production of common ostrich feathers, and asking their co-operation and assistance to minimise the output of common feathers. Further, that Government be requested to appoint an officer or officers to give instruction and practical demonstrations on farms, and at other places in the Colony, showing the detrimental effect of faulty plucking of feathers, especially the plucking of short and cheap feathers.*"

H.—Caponisation.

In discussing the elimination of inferior birds, Mr. Rubidge stated that the caponising of ostriches very much improved the quality of the feathers, by rendering the birds less restless and pugnacious, and that this, therefore, might be regarded as one means of overcoming the difficulty of an excessive supply of inferior feathers. He quoted figures to show that after caponisation the value of his pluckings rose from 22s. 6d. to £5 10s. He thought that as practical farmers they should take this into serious consideration, and select a few of the superior birds for breeding and caponise the rest, and thus from two points of view keep down the production of inferior feathers.

In reply to a question from Mr. Bowen, Mr. Rubidge stated that the caponised birds from which he received a return of £5 10s. were cocks and hens together, and that they had been caponised two years. Mr. Painter remarked that with regard to caponising he had found that castrating rams very often improved the quality of the wool, so he thought it was quite possible that caponising would do the same for the feathers of an ostrich.

J.—Possibilities of an Increase in the Demand for Feathers.

Before adopting any measure for reducing the supply of feathers it is worth while to consider what is the likelihood of the supply exceeding the demand, and also what means may be adopted for increasing the demand so as to keep pace with the increasing supply. As already stated, there is at present no indication that the supply of good feathers is more than the market can absorb; with the increasing production more and more uses to which feathers can be applied are discovered, and their adoption is extending over a wider and still wider area. As in the case of diamonds so with feathers, a larger supply has resulted in an extended demand, and with proper regulation there seems as yet no reason why this extension should not continue. When the whole world is taken into account the changes of fashion, upon which feathers depend, are not so erratic as would seem to be the case where a single country only is considered; fashions for the generality of wearers travel slowly and change slowly, a particular demand increasing in one country while diminishing in another. From the stability of the feather market within the past few years it may reasonably be assumed that, in spite of changes of fashion, a fairly constant, even if not increasing, demand exists when different countries are considered as a whole.

In the opinion of many competent to judge, there are still large populations to which the use of feathers as decorative articles can yet be introduced so as to absorb the increasing supply; by these the ostrich industry is still considered to be in its infancy. The demand is extending rapidly in America, both North and South, and there are those who predict that, with the westernising of the Orient, ostrich feathers will be introduced and become fashionable with the millions of Japan and China. Furthermore, it is axiomatic that the larger a trade becomes the more people are concerned in its maintenance and development, and the more likely is it to maintain a certain degree of stability in spite of temporary vicissitudes, therefore, the larger the feather trade becomes the more likely is it to be founded on a secure basis

(Signed) R. W. Thornton, Govt. Agriculturist.
,, J. E. Deurden, M.Sc., Ph.D., A.R.C.S.

BILIARY FEVER OR MALIGNANT JAUNDICE OF THE DOG (CANINE PIROPLASMOSIS).

THE DRUG TREATMENT.

By WALTER JOWETT, F.R.C.V.S., D.V.H., Veterinary Branch, Cape Town.

The following observations relate to a method of treatment for canine piroplasmosis recently discovered and described by Professor Nuttall, of Cambridge University, and Dr. Hadwen, of the Health of Animals Branch, Department of Agriculture, Canada.

These two investigators found that the administration of a dye known as Trypan blau, to dogs suffering from biliary fever, resulted in most instances in effecting a speedy cure.

This disease, being a veritable canine scourge in the Cape Peninsula, and along the coastal area of the Colony, and for some distance inland, it was decided to institute a series of experiments at the Rosebank Experimental Station in order to verify this reported successful method of treatment as applied to the disease met with in the Cape, and also to ascertain its usefulness or otherwise in regard to certain other diseases of animals.

As a preliminary to the carrying out of these tests, it was necessary to procure an animal (dog) actually suffering from the malady (C. piroplasmosis) in order that other canines might be infected therefrom. This was finally accomplished, an Irish terrier being handed to the writer in the last stages of the disease, and from this animal a series of dogs were infected by experimental blood inoculation. A number of the animals so infected, after manifesting symptoms of the disease quite apparent to the untrained observer, were placed under treatment and the result carefully noted, the remainder, a small proportion, after being infected with the malady in like manner, being left without treatment to act as controls. In addition to these animals, a few dog owners very kindly came forward with their sick dogs—animals which had contracted the disease under natural conditions, *i.e.*, by the bites of infected ticks; after verifying the presence of the causal agent of biliary fever in their blood, by microscopical examination of that fluid, these also were placed under treatment.

Two of these last mentioned animals unfortunately, when submitted for treatment, were almost *in extremis*.

Before proceeding further, it may be said that excepting for the two animals just mentioned—in which recovery was quite hopeless—the Trypan blau treatment proved an unqualified success, and our experiments entirely confirm those of Professor Nuttall and his co-worker.

When administered by subcutaneous or intravenous injection, Trypan blau speedily colours the tissues of the animal a more or less well marked blue shade. This is, naturally, most noticeable in the case of white dogs, such as fox terriers, and is most apparent on the inner aspect of the hind legs, on the under surface of the abdomen, and on the membrane lining the mouth and eyelids. The animal remains so coloured for some days, when the blue coloration gradually passes off, disappearing first from the membrane lining the mouth, and later from the skin covering the lower surface of the abdomen. The urine likewise assumes a blue colour.

In those subjects which die after undergoing treatment with this dye, it is found that practically all the tissues of the body are of a vivid blue tint.

On the causal organism of biliary fever, the action of the dye is very marked. When injected into a dog obviously ill and harbouring many piroplasmata in its blood, no very noticeable change may be apparent for a time to the casual observer, excepting of course that the subject becomes coloured. If, however, one proceeds to examine the blood of such subject, it is found that the parasites therein present become less in number, and in a few hours have totally disappeared. Associated with their disappearance there is invariably a fall in the body temperature, the animal may remain dull and listless and apparently ill for some twenty-four hours or so after the injection of the dye, this notwithstanding that its blood may be freed from parasites and the hyperthermia less marked; soon, however, the subject is appreciably better, it manifests a desire for food, and its recovery then, in many instances, is rapid and complete. True, some days afterwards if the body temperature be recorded, periodic elevation will be noticed, but these do not seem to be associated with obvious signs of ill-health.

This is the state of affairs when an animal is submitted to the treatment before its condition has become hopeless. Here it may be said that in all our experiments, treatment was not commenced until the subject was obviously ill, *i.e.*, until the casual observer could see that something was amiss with the animal Some of the experimental animals indeed were seriously ill before being placed under treatment. In one or two instances hæmogloburic urine was a characteristic symptom, and yet such subjects recovered.

Needless to say in all the experimental animals the presence of the causal parasite of the disease was demonstrated in the blood prior to commencing treatment, and in all cases the results were controlled by microscopical examination, together with clinical observation and careful and regular thermometric readings.

Mode of Treatment.

The dye must be injected under the skin or directly into a vein. Administered by the mouth it exerts no beneficial effect whatever. (See record of experiment No. 11.)

When injected under the skin, it unfortunately gives rise in many instances, to some local irritation, producing in certain cases considerable swelling at the point of injection, and occasionally abscess formation and sloughing of a small portion of skin. This, notwithstanding that all precautions may have been observed to prevent organismal contamination—careful sterilisation of the syringe and needle used for injection, washing and disinfection of the point of inoculation, etc.

On account of this disadvantageous feature, it is advisable whenever possible to inject the drug directly into the blood stream; by this means the action of the dye is speedily exerted, and one obviates entirely any possibility of the appearance of a troublesome local swelling or abscess

formation. With practice it is not a very difficult matter to inject the drug in this way directly into the vena saphena in the hind leg of a large or medium sized dog (this operation should, not, however, be attempted by other than an expert). The operation is not so simple *in a small, fat, woolly, and anæmic animal.* If, for any reason, intravenous injection of the drug is impracticable, then the solution may be injected merely under the skin. True, a swelling may form, and this may perhaps be troublesome, still this is of but little moment when compared with saving the animal's life.

A saturated aqueous solution of the dye may be injected either into the vein or under the skin; this is roughly a 3 per cent. solution. We have prepared this solution by adding a measured quantity of recently boiled water to a definite quantity of the dye, using the liquid when at blood heat. In some instances, the solution has been boiled shortly before use, and we have not noticed any impairment of its action by this procedure. For small adult dogs and puppies a one per cent. solution should be injected subcutaneously. In very small animals, where but little of the drug is introduced under the skin, there may be but slight local swelling at the site of injection.

It is probably advisable, if not absolutely essential, to use a *freshly prepared solution,* and in the experiments recorded hereunder practically only such has been utilised; in but one or two instances had the solution been stored for some days prior to its injection.

The following is a record of the experiments conducted at the Rosebank Experimental Station.

RECORDS OF EXPERIMENTS (ABSTRACTS)

Experiment A.—On Three Dogs.

All infected experimentally by injection of blood obtained from a naturally infected case immediately after death. Dose of blood injected subcutaneously = 1 cubic centimetre.

No. 1.—Fox Terrier in good condition. Weight 13 lbs.

5th day after infection.—Morning temperature, 102°. Evening, 103·8°.

6th day.—a.m. and p.m., 104°. Blood examined microscopically—negative.

7th day. Temperature, a.m., 103·6°; p.m., 105°. Piroplasmata present in blood—2 to film. Dog dull and listless.

8th day.—Temperature, 105·6°—105·4°. 0·75 per cent. of red blood cells infected with parasites. Dog obviously ill, dull, appetite capricious.

9th day.—Temperature, 105·6°—104·6°; 2·3 per cent. of red cells infected. Very ill. Refused food. Membranes pale. Urine not red coloured. About 5 cubic centimetres of blood drawn from jugular vein (for future inoculation purposes). Subsequently:

Treatment.—Five cubic centimetres of Trypan blau (saturated solution) injected subcutaneously.

10th day.—Temperature, 105·6°—103·4°. No organisms found in blood films. (Examined 14 hours after injection of Trypan blau.) Leucocytosis. Anæmic lesions—(Polychromasia, anisocytosis). Skin and mucous membranes deeply coloured blue. Dog very ill.

11th day.—Temperature, 102·6°—102°. Marked improvement. Dog lively and eating. Still very deeply coloured. Microscopical examination of blood negative.

From this day to the 30th and onwards the animal made an uninterrupted recovery. Its temperature fluctuated between 101° and 102° until the 21st day, when it rose to 103°; next morning, however, it had returned to 102°, and thereafter remained normal. The blood was repeatedly submitted to microscopical examination, but although anæmic degeneration of the red cells was observed during the first part of the period after treatment, reappearance of the piroplasmata was not noted. The blue coloration of the skin and mucous membranes persisted until the 16th day (after the injection of the dye) when it commenced to disappear from the membrane lining the lips and mouth. A trace of the blue tint was still perceptible on the skin covering the abdomen three weeks after the date when the drug was administered. In this animal there formed a somewhat painful swelling at the site of injection of the dye; this latter proceeded to abscess formation, which necessitated it being opened and treated antiseptically. Under such treatment it speedily healed. At the 36th day after infection the dog weighed 15 lbs.—he had gained 2 lbs. in weight.

Result.—Recovery under treatment complete and very satisfactory. No loss of condition.

No. 2.—An Irish Terrier (mongrel). Condition fair. Weight 36 lbs.

8th day after infection.—Temperature, 102·6°—104·4°. Blood examination—piroplasmata present 2 or 3 to film.

9th day.—Temperature, 105·2°—104·6°. 0·25 per cent. of red cells infected. Dog dull, but still eating a little.

10th day.—Temperature, 104·4°—103·8°. 0·4 per cent. of red blood corpuscles infected. Dog obviously ill. Food refused. Membranes anæmic. Urine not red coloured (hæmoglobinuric).

Treatment.—10 cubic centimetres of a saturated solution of Trypan blau injected subcutaneously.

11th day.—Temperature, 103·4°—104·6°. Evidently very ill. Skin and mucous membranes intensely blue coloured. Food entirely refused. Dog dull and depressed. Blood examination negative.

12th day.—Temperature, 102·6°—102·6°. Marked improvement. Lively. Feeding quite well. Blood examination—no parasites. Anæmic lesions of red cells. Leucocytosis.

13th day.—Temperature, 101·6°—101·2°. Improvement maintained. Colouration of skin and mucous membrane very marked. Painful swelling at site of injection of dye (opened and dressed).

14th to 20th day.—Temperature varied between 100° and 102°, and animal continued, to all appearances, in good health. Blood examination—invariably negative.

22nd and 23rd day.—Temperature, 103°—103·4°. Dog slightly dull, but appetite normal. Blood examination negative. Skin and mucous membranes still coloured.

23rd to 30th day and onwards.—The temperature speedily returned to normal, and the animal made an uninterrupted recovery. The blue colouration of the skin and membranes gradually disappeared.

Result.—Recovery satisfactory and complete.

A No. 3.—White Terrier (mongrel Fox Terrier). Condition fairly good.

7th day after infection.—Temperature, 102°—102·8°. Dull and listless.

8th day.—Temperature, 103·6°—104·2°. Dog obviously ill. Blood examination—positive. 0·5 per cent. of red cells infected.

9th day.—Temperature, 104·8°—105·8°. Dog very ill. Mucous membranes pale. Urine red coloured (hæmoglobinuric). Blood examination—7 per cent. of cells infected. About 5 cubic centimetres of blood withdrawn for purposes of inoculating other subjects.

10th day.—Temperature, 103·6°. Blood examination—almost every red cell infected. Urine very highly coloured with hæmoglobin—like blood in appearance. Dog died about 4 p.m.

Result of Experiment 1.—Of three dogs experimentally infected with biliary fever, the two which received treatment with Trypan blau (one dose) promptly recovered, whilst the control dog (not treated) died.

Experiment B.—Two Puppies.

Experimentally infected. 1 cc. of virulent blood (obtained from dog No. 1 prior to treatment) injected subcutaneously into each.

No. 4.—Age, about 2 months. Weight, 3½ lbs

8th day.—Temperature, 101·8°—102·4°. Blood examination positive—1 parasite found in film. Polychromatophilia. The presence of macrocytes noted.

9th day.—Temperature, 102·4°—103·2°. 0·4 per cent of red cells infected with piroplasmata. Puppy dull and refused food.

Treatment.—3 cc. of Trypan blau soln. (1 per cent.) injected subcutaneously.

10th day.—Temperature, 102·8°—102·8° Puppy coloured blue (both skin and mucous membranes). Dull and disinclined for food. Blood examination negative.

11th day.—Temperature, 101·6°–101°. Much better, lively and taking milk quite readily. Blood examination—negative.

11th to 28th day.—Recovery uninterrupted. No swelling at site of injection. Blue colouration barely perceptible on fifteenth day after infection of Trypan blau.

No. 5 Puppy.—Weight 4 lbs. Same age as No. 4.

7th day.—Temperature, 101·8°—102°. Blood examination negative.

8th day.—Temperature, 102°—103·2°. Piroplasmata present in blood—5 or 6 to film.

9th day.—Temperature, 103°—102·8°. Dull. Appetite capricious. About a dozen piroplasmata to film.

10th day.—Temperature, 103·6°—104·2°. Puppy very ill. Piroplasmata numerous in films—20 per cent. of red cells infected. (Examination 5 o'clock p.m.)

11th day. Found dead.

Post-mortem.—Spleen much enlarged. Hæmoglobinuric urine in bladder. Smears from heart's blood and organs, very heavy percentage of cells infected with parasites.

Result of Experiment B.—Of two puppies experimentally infected, the one receiving treatment speedily recovered, whilst the control (untreated) succumbed.

Experiment C.—Two Puppies.

Experimentally infected with blood drawn from dog A. No 3 day before death. Dose injected subcutaneously into each—2 cubic centimetres.

No. 6.—Puppy about 2 months old. Weight, 3½ lbs.

5th day.—Temperature, 102·8°—103·2°. Blood examination positive—0·5 per cent. of red cells infected.

6th day.—Temperature, 103·8°—104·2°. Obviously ill. 1 per cent. of cells infected. Anæmic lesions of blood in evidence.

Treatment.—3 cc. of solution of Trypan blau (1 per cent.) injected subcutaneously.

7th day.—Temperature, 102°—102°. Blood examination—negative. Leucocytosis. Obviously ill, dull, not eating, but drank little milk. Skin and mucous membranes coloured blue

8th day.—Temperature, 102°—101·2°. Better. Eating. Blood examination—negative.

9th day.—Temperature, 101°—100·8°. Apparently recovered. No swelling at site of injection Very blue.

19th to 28th day.—Uninterrupted recovery. No loss of condition. Blue colouration perceptible 15th day after injection.

Remarks.—Rapid and satisfactory recovery under treatment.

No. 7. Puppy—Two months old. Weight, about 3½ lbs.

6th day.—Temperature, 101·6°—101·8°. Blood examination positive—one parasite in film.

7th day.—Temperature, 101·8°—101·4°. Four to film. Puppy dull and listless. Still drinks a little milk.

8th day.—Temperature, 103°—103·6°. About a dozen piroplasmata found in film. Obviously ill. Still taking milk.

9th day.—Temperature, 103°—104·4°. Piroplasmata present in blood. About 0·5 per cent. of blood cells infected. Condition much the same as previous day. Very ill.

10th day.—Temperature, 103°—103·2°. Percentage of infected cells not enumerated, but 3 or 4 were present in every field of microscopic (Zeiss obj. 1-12 in., Oc. No. 4). Very ill.

11th day.—Temperature, 103·8°—101°. Blood not examined.

12th day.—Temperature, 97·6°—96·6°. Blood examination negative.

From this day onwards the temperature fluctuated between 97° and 102° (19th day). Blood examined daily, either negative or only one or two parasites found to film. They became more numerous, however, on the 19th day, when five or six appeared to each film. Anæmic lesions of blood corpuscles constant (Polychromasia, basophilia, anisocytosis—occasionally one or two normoblasts per film). The puppy became emaciated; its mucous membrane acquired an icteric tint. On the 20th day its temperature was below 95°, and it was very weak, wasted, and the blood terribly anæmic. Death occurred during the night.

Result.—Of two puppies infected experimentally, the one submitted to treatment with Trypan blau promptly recovered, whilst the control (untreated) succumbed.

Experiment D.—On Three Dogs.

No. 8.—About 6 months old. Weight, 17½ lbs. Inoculated intravenously with bloody serum ex. pup No. 5 at death. Dose injected—2 cubic centimetres intravenously.

4th day.—Temperature, morning, 101·4°; evening, 104·2°.

5th day.—Temperature, 105·2°—104·8°. Dog very dull. Few piroplasmata found in blood—about 3 or 4 in film.

6th day. Temperature, 104·6°—106·2°. Obviously very ill. Not feeding. Urine red coloured (hæmoglobinuric). Blood examination—9·5° per cent. of red cells infected. About 5 cubic centimetres of blood withdrawn from jugular vein for the purpose of inoculation, subsequently:—

Treatment.—4·5 cubic centimetres of Trypan blau (saturated solution) injected subcutaneously. Examined four hours later—the mucous membranes lining mouth, the skin, and urine were all coloured blue.

7th day. Temperature, 104°—104·2°. Still very ill. Blood examination—negative (no parasites).

8th day.—Temperature, 102·2°-102°. Better. Commenced feeding. Blood examination negative.

9th day.—Temperature, 101°—101°. Much better. Lively and feeding. Still very blue.

10th day.—Temperature, 101·4°-101·6°. Apparently recovered.

11th to 18th days inclusive. The temperature remained normal, and the puppy seems to have made an excellent recovery.

No. 9.—Brown puppy, 2 months old. Weight, 4 lbs. Inoculated subcutaneously with 2 cubic centimetres of blood-tinged serum (containing red cells and many piroplasmata) ex. No. 5 at death.

1st day. Temperature, morning, 104·2°; evening, 101·8°.

2nd day.—Temperature, morning, 101·2°; evening, 101·4°.

3rd day.—Temperature, morning, 101·6°; evening, 101°.

Although at this stage the puppy was not visibly sick and piroplasmata were not present in its blood (on microscopical examination) it was inoculated subcutaneously with Trypan blau in order to note the action of this drug in preventing the appearance of the parasites.

Treatment.—2 cc. of a 1 per cent. solution injected subcutaneously (half the "curative" dose).

4th day.—Temp.	102·2°;	evening,	102°.	Blood exam.—negative.
5th day.— ,,	101·6°;		102°.	
6th day.— ,,	101·4°;		101·6°.	
7th day.— ,,	102° ·		101·8°.	
8th day.— ,,	99·2°;		99·6°.	
9th day.— ,,	101° ;		101·4°.	
10th day.— ,,	100·4°;		102·6°.	
11th day.— ,,	100·8°;		101°.	
12th day.— ,,	100° ;		102°.	

13th to 16th day.—The temperature remained normal and piroplasmata were never found in the blood, although repeatedly examined microscopically.

At a later date an attempt will be made to infect this animal with the disease. In this way it will be possible to determine whether any immunity was conferred by the above-mentioned experiment.

No. 10.—In this experiment the process was reversed. The dog was injected first with the Trypan blau and some days later an attempt was made to infect it with the disease (biliary fever) by the subcutaneous injection of a dose of virulent blood, which proved fatal for controls. The dog weighed 15¼ lbs. (a mongrel terrier)—had been in owner's possession since birth, and had never previously been sick.

15 cc. of a 1 per cent. solution of Trypan blau injected subcutaneously; this coloured the dog deeply. On the 6th day following the injection, and whilst still well coloured by the dye, 1 cc. of virulent blood (ex. No. 8 withdrawn prior to treatment) was injected intravenously. The animal's temperature was irregular during the following 12 days, but although its

blood was repeatedly examined microscopically, it was never possible to demonstrate the presence of piroplasmata therein. It is unlikely that the animal acquired immunity by the process; this, however, will be ascertained at a later date by submitting the animal to the attack of infected ticks and noting the result

Experiment E.—On Three Puppies.

No. 11.—Black pointer puppy, about four months old. Weight, 18½ pounds. Inoculated *intravenously* with 1 cubic centimetre of blood drawn from No. 8 on 6th day (day prior to treatment).

1st day.—Temperature, a.m., 103·8°; p.m., 102·8°.

2nd day.—Temperature, a.m., 102°; p.m., 102°.

3rd day.—Temperature, a.m., 103·8°; p.m., 105°.

4th day.—Temperature, a.m., 107°; p.m., 106·4°.

Obviously ill. Blood examination—many piroplasmata present. 13·3 per cent. of red cells infected.

Treatment.—1 fluid ounce of Trypan blau solution (saturated) *administered by mouth.*

5th day.—Temperature, a.m., 106·2°; p.m., 102·2°. Dog very ill. *No blue colouration of skin or mucous membranes.* Urine *red* coloured (hæmoglobinuric). Blood examination—massive infection of red cells—almost every red corpuscle contained parasites.

6th day.—a.m., found dead.

Post-mortem.—Typical of canine piroplasmosis. No blue colouration.

Remarks.—Administered by the mouth Trypan blau: (1) produced no blue colouration, and (2) exerted no curative action.

No. 12.—Pointer puppy. Weight, 19½ lbs. Inoculated intravenously (saphenic vein) with 1 cubic centimetre of blood (source as in No. 11). The temperature rose to 104·6° on the evening of the 3rd day after infection.

4th day.—Temperature, a.m., 103·2°; p.m., 104·6°. Blood examination—about half-a-dozen parasites found along edge of film. Puppy dull.

5th day.—Obviously ill. Temperature, 105·4°—106·4°. Blood examination—parasites more numerous; (not enumerated, but about 15 counted in film).

6th day.—Temperature, a.m., 105°. p.m., 105°. Very ill. Food refused. Blood examination—parasites present more numerous than on 5th day, but exact proportion of infected cells not enumerated, some of infected cells contained four and others eight parasites. About two dozen parasites observed in film. Also noticed—anæmic lesions of blood: Polychromasia, anisocytosis and poikilocytosis. Basophilic granulations noted in case of two cells, one containing parasites, other free. Normoblasts were also present—3 or 4 to film.

Treatment.—5·5 cubic centimetres of Trypan blau injected intravenously.

7th day.—Temperature, 101·4° morning; evening, 102·4°. Dog coloured very blue—urine included. Lively and feeding. Marked improvement. Blood examination negative.

8th day.—Temperature, 102°—102·4°. Blood examination negative.

9th day.—Temperature, 102·8°. Blood examination negative.

Improvement maintained. To all appearance, at the time of writing, the dog is in normal health, and with the exception that he is coloured blue, a clinical examination would show nothing amiss.

In this case a sufficient interval has not elapsed since the institution of the treatment to enable one to say that recovery will be permanent, although the dog shows every indication that such will be the case.

No. 13.—Control (untreated). Brown puppy, 2 months old. Weight, 4 lbs. Inoculated subcutaneously with 1 cc. of virulent blood. (Source as in No. 11).

Piroplasmata were first found in the blood on the 7th day after infection.

7th day.—Temperature, a.m., 101·4°; p.m., 101·4°. Puppy not feeding well. Dull. Blood examination—about 6 parasites counted along edge of film.

8th day.—Temperature, morning, 102·6°; evening, 103·4°. Condition much the same as on preceding day. Blood examination—1·3 per cent. of red cells contained parasites.

9th day.—Temperature, 103°—103·4°. Puppy obviously ill. Blood examination—9 per cent. of red cells infected. Visible mucous membranes, pale and anæmic.

10th day.—Morning temperature, 102°. Very ill indeed. Lay stretched out and indifferent to surroundings. Urine blood-coloured (hæmogloburic). The puppy died about midday. Blood examination—from ear vein when on point of death a massive infection—almost every red cell contained parasites. Cells enclosing 4 and 8 piroplasms were relatively common.

Post-mortem.—Lesions typical of canine piroplasmosis. Spleen enlarged. Urine in bladder red coloured.

RECORD OF CLINICAL CASES.

This group includes only animals which acquired the disease under natural conditions, *i.e.*, by means of infected ticks. The dogs here referred to were handed over for treatment when obviously very ill indeed—two in fact died soon after their admission. The remainder (four) were very well marked cases, and we fully believe that had they not received the Trypan blau treatment all these animals would have succumbed to the malady.

It is true that animals do occasionally recover from biliary fever, even in the absence of drug treatment. Such an occurrence, however, is far from common, in fact we may go further and say that it is very rare indeed.

Comparing the experimentally induced disease (*i.e.*, that following the inoculation of virulent blood) with the naturally acquired one—that is by tick infection—we incline to the belief that the latter is the more severe, and the one less frequently followed by recovery.

But to return to our four successfully treated clinical cases—these, at the time of writing, are all on the high road to recovery.* In one, a relapse occurred on the 17th day after the injection of the dye—piroplasmata reappeared in the blood and the animal was very anæmic; nevertheless, it remained quite lively, and continued to feed much as usual. The disease in fact, in this case, has assumed the chronic form with few parasites in the blood. In this animal, as in the remainder of our naturally infected dogs, a sufficient length of time has not yet elapsed to enable one to state with absolute certainty that the recovery will be permanent. We fully expect, however, that such will be the case.

It would have been advisable, perhaps, to have omitted all mention of these incompletely recovered animals until a later date, but, after due consideration, we decided to include them in our report, mainly for the benefit of those who might wish to treat similar cases. We were constrained to do

* Since the above was written the improvement has been maintained in every case; the recovery is complete.

this, in view of the prevalence of canine biliary fever in the Cape Peninsula at the present season.

Briefly the details of these "clinical" cases are as follows:—

Nos. 1 and 2.—Handed in for treatment when in far advanced stages of disease. In each case an injection of Trypan blau was given, but as was feared at the time when administered, recovery was hardly to be expected. One dog died an hour or so after receiving an appropriate dose of the dye, whilst the other succumbed the day following.

No. 3.—A brown and white fox terrier. Weight, 14½ lbs. Had been sick for some days, owner uncertain exactly how long.

Condition on admission—obviously very ill. Temperature, 104·4°. Visible mucous membranes anæmic. Urine red coloured (hæmoglobinuric). Blood examination—positive, piroplasmata scanty, about 5 or 6 in film only.

Treatment.—5 cubic centimetres of a saturated solution of Trypan blau injected subcutaneously.

1st day after treatment.—Temperature, a.m., 101°; p.m., 104·2°. Dog dull and listless. Still very ill. Food entirely refused. Skin and mucous membranes deeply coloured blue. Blood examination—negative. Anæmic lesions much in evidence. (Polychromasia, anisocytosis, normoblasts.)

2nd day.—Temperature, 102·2°—102·8°. Much better. Appetite returned though capricious. Large painful swelling at site of injection. Later in the day the dog became quite lively and took food readily.

3rd day.—Temperature, 102°—100·8°. Marked improvement. Quite lively and feeding well. Swelling at site of injection lanced; much blue-coloured fluid escaped. Dressed with lysol.

4th day.—Temperature, 100·6°—101·2°. Improvement maintained. Blood examination negative. The temperature remained normal until the 10th day after treatment, when it rose to 103·2°. Next day it stood at 104·8°, but the day following had returned to 102·8°—102·2°. A day or two later it rose again to 103·6°, but once more returned to normal. Although blood examinations were repeatedly made, the reappearance of piroplasmata was not noted.

On the 17th day after treatment, the temperature rose for the third time; the observations on this and the following days were as follows:—

17th day.—Temperature, a.m., 102°; p.m., 103·6°. Dog lively and feeding. Still coloured blue (both skin and visible mucous membranes). Rather thin. Blood examination—positive; 0·7 per cent. of red cells contained parasites. Anæmic lesions in evidence.

18th day.—Temperature, 103·2°—104·6°. Not feeding quite so well. Weight, 12½ lbs. Blood examination—positive; much the same as on previous day. Many nucleated red cells present.

19th day.—Temperature, 103·4°—103·8°. Better. Feeding readily. Blood examination—piroplasmata present; percentage of infected cells not enumerated, but about a dozen counted in film. Many nucleated red cells. Polychromatophilia marked.

20th day.—Temperature, 101·6°. Blood examination negative. Dieted with an allowance of raw meat and bone marrow. Tonic prescribed: Citrate of iron and quinine. Under this treatment the dog is progressing very satisfactorily, and at the time of writing shows every evidence of making a complete recovery.

No. 4.—An Irish terrier. Weight, 32 lbs.

1st day. Condition on arrival—obviously very ill. Dull, listless and depressed. Blood examination—positive; 7 or 8 parasites per film. Mucous membranes anæmic. Urine red coloured (hæmoglobinuric). Temperature, 103·6°.

Treatment.—Injected intravenously 10 cubic centimetres of a saturated solution of Trypan blau.

2nd day.—Very ill, weak and staggering. All food refused. Temperature, morning, below 95°; evening, 98·4°. Coloured blue (skin and visible membranes). Blood examination—negative, but terribly anæmic.

Treatment.—Injected subcutaneously 200 cubic centimetres of sterile normal saline solution, and later an additional 2 cubic centimetres of a saturated solution of Trypan blau.

3rd day.—Temperature, 101·2°. Apparently better. Drank milk. More interest taken in his surroundings. Blood examination—negative.

4th day.—Temperature, 102·2°—101·6°. Considerable improvement. Feeding quite well. Blood examination—negative. Anæmic lesions prominent. Also leucocytosis. Swelling (painful) at place where Trypan blau was injected (subcutaneously). Urine olive green colour Skin and mucous membranes blue.

5th day.—Temperature, 102·6°—103°. Improvement maintained. Small slough at site of injection of dye.

6th day.—Temperature, 101·4°—102·6°.

7th day.—Temperature, 101·4°.

Wound at site of injection healing, and in general the dog is progressing very satisfactorily. Blood examination remains negative.

Apparently, at the time of writing, the dog is on the high road to recovery.

The other two clinical cases at present under treatment are:—

No. 5.—An Airedale terrier. Weight, 35 lbs. Very ill on arrival. Urine red coloured (hæmoglobinuric). Blood examination—positive.

Treatment.—13 cubic centimetres of Trypan blau (saturated solution) injected subcutaneously. This caused the parasites to disappear from the blood, with a corresponding improvement in the dog's condition.

A large swelling formed at the site of injection—this was subsequently lanced and dressed antiseptically.

The dog is now progressing satisfactorily, but is still very anæmic. Under suitable dieting and treatment he will, no doubt, make a complete recovery.

No. 6.—A Newfoundland. Weight, 65 lbs. Very ill indeed when admitted to treatment. According to owner had been sick for at least a week. Urine was hæmoglobinuric. Blood examination—positive—parasites fairly numerous.

Treatment.—20 cubic centimetres of Trypan blau (saturated solution) injected intravenously. Next day he was slightly better, but much to our surprise was coloured only faintly blue. Blood examination—after much search an infected red cell was found, this containing two pyriform parasites.

Treatment.—A further 5 cubic centimetres of Trypan blau solution was injected intravenously. This intensified the blue colouration and caused the total disappearance of parasites from the blood.

The dog is now feeding quite well and is evidently much improved. In this case there was no swelling at the site of inoculation.

At the time of writing the animal is progressing satisfactorily towards recovery.

SUMMARY.

Experimental Cases.

Six dogs infected experimentally with Biliary Fever (by injection of virulent blood), and subsequently treated with one injection of Trypan blau; all recovered.

Four dogs injected in like manner, but which did not receive drug treatment; all died.

One experimentally infected dog in which the treatment was attempted by the administration of a dose of Trypan blau *by the mouth* also succumbed.

One dog infected experimentally and injected three days later subcutaneously with half dose of Trypan blau before parasites had appeared in its blood remained well; as did also an animal which received a dose of Trypan blau and six days later an injection of virulent blood.

Clinical Cases.

Two dogs in which treatment was attempted when moribund—died.

Four dogs very ill and manifesting severe symptoms of biliary fever (red coloured urine, anæmia, yellow coloured membranes, etc.), under treatment by injection of Trypan blau—all recovered.

Immunity.

Immunity is known to follow recovery from the naturally acquired disease; and, in the case of dogs living in infected areas, this immunity is maintained and reinforced by the further repeated tick infection to which they are exposed. In the absence of this, it is doubtful whether the immunity of "salted" animals is of any considerable duration (*i.e.*, lasting for more than from one to two years). Throughout the duration of the period of insusceptibility it is known, of course, that the blood of the "recovered" dog is infective for "clean" ones, the same, whether it be inoculated into the latter experimentally with a syringe, or by means of the dog tick.

In regard to dogs which have recovered from an attack of biliary fever as a result of the "Trypan blau" treatment, it remains to be seen:

1. Whether the blood of such dogs is still infective on inoculation into susceptible canines; and
2. Whether, after recovery from the disease in consequence of the Trypan blau treatment, the subject possesses an immunity against subsequent infection equal to that following the recovery, which occasionally occurs without drug treatment.

It is expected that such will be the case,* and in the event of further experiments confirming this expectation, one would be in a position to immunise susceptible canines, by (1) infecting them with the disease, either by blood injection or by tick infestation, and (2) so modifying the resulting re-action by nursing and treatment that recovery would be assured, in other words passing the subject through a mild form of the disease. Thereafter the immunity of animals living in an infected region would be maintained by the periodic tick infestation to which they would naturally be exposed from time to time.

* Since the above was written the dog mentioned in the foregoing experiments (A. No. 1) has resisted an inoculation of virulent blood; he is now therefore evidently immune.

An endeavour will be made to elucidate these points by further experimental work, and for this purpose we intend to utilise the "recovered" dogs mentioned in the foregoing records together with others. Some weeks and months hence, a number of these animals will be submitted to the attacks of infected ticks, whilst others will receive an injection of virulent blood. In this way it will be possible to ascertain the duration and degree of their immunity.

Whether or not these expectations be realised, the fact remains that the researches of Professor Nuttall and Veterinary Surgeon Hadwen have given us a successful method of curative treatment for the disease canine biliary fever, a disease in regard to which all former methods of treatment proved ineffective.

Action of Trypan Blau on certain other Animal Diseases.

Heartwater of Sheep and Goats.—Experiments now in progress at Rosebank.

South African Redwater of Cattle.—Experiments in progress. It is anticipated that the dye will prove efficacious as a curative for this disease, as it seems to have done for the milder "English" form of red water (cattle).

East Coast Fever.—One experiment conducted by Nuttall and Hadwen. Trypan blau exerted no curative action.

MILK RECORD.

ELSENBURG COLLEGE HERD.

Subjoined is the Milk Record to the 30th September, 1909 :—

Breed and Cow.	Days in Milk.	Yield in Lbs.		
		During September	Total to date.	Daily Average.
FRIESLANDS.				
Daisy	252	100	7,950	30 3
Cleopatra	150	1,023	6,856	45·7
Victoria	141	1,072	5,824	41 3
Vera	99	877	2,968	30·0
Violet	80	1,172	3,222	40·2
Bell	68	1,422	3,170	46·6
Belladonna	31	892	919	29·6
JERSEYS.				
Gertie	143	754	3,834	26·8
Gwendolen	99	787	2,499	25 2
Grace	99	628	2,100	21·2
Gladys	92	823	2,535	27·5
Gus	49	797	1,262	25·7
Fanny	37	746	899	24 3
Gilliflower	30	1,051	1,051	35 0
AYRSHIRES.				
Queen Dot	88	740	2,530	28·7
Lobelia	77	861	2,464	32·0
SHORTHORN.				
Maggie	78	1,022	2,568	32·9
CROSS.				
Bessie	99	1,430	4,841	48·9

AGRICULTURAL UNION OF CAPE COLONY.

TWELFTH ANNUAL CONGRESS, 1909.

HELD IN CONJUNCTION WITH THE WESTERN PROVINCE VINE AND FRUIT GROWERS CONGRESS.

The Twelfth Annual Congress of the Agricultural Union of Cape Colony was opened in the City Hall, Capetown, on Tuesday, Sept. 28th. The gathering, this year, took the form of a joint congress, the Western Province Vine and Fruit Growers Associations having expressed a desire through the Western Province Horticultural Board, to hold their Annual Congress at the same time The Congress was constituted as under:—

PRESIDENT: Mr. C. G. Lee.
VICE-PRESIDENTS:—The Hon. P. W. Michau, M.L.A, and Col. W E. Stanford, C.M.G., M.L.A.
HON. VICE-PRESIDENTS:—Mr. G. H. Maasdorp, M.L.A.; the hon. T. W. Smartt, M.L.A.; the hon. Arthur Fuller, M.L.C.; Mr. D. M. Brown, M.L.A.; Mr. P. Ryan; Mr. J. Rawbone, hon treasurer; the hon. John Daverin, M.L.C., and the hon. F. S Malan, M.L.A, Minister for Agriculture.
EXECUTIVE COMMITTEE:—Messrs. E. T. L. Edmeades, P. R. Malleson, R. H. Struben, T. T. Hoole, J. Starke, A. P. Everitt and D. J. de Wet, who were present. Messrs. F. C. Bayly, O. E. G. Evans, E. M. Warren, A. W. Douglass, R. Watson and S van Aardt were unavoidably prevented from attending. Govt. Representatives: Under-Secretary for Agriculture, Chief Vet. Surgeon, Govt. Entomologist, Director Veterinary Laboratory, Horticultural Assistant and Editor of the "Agricultural Journal."

The following centres were represented by delegates as under:—

Albany.—Messrs. H. Fitchat, M.L.A., and T. T. Hoole.
Aliwal North:—Messrs. N. E. Smuts, C F. F. Truter, C. W. Cloete, M.L.A., and the hon. C. A. Schweizer, M.L.C.
Bathurst:—Mr. Stephen Smith.
Bayville:—Mr. R. Lundie, M.L.A.
Beaufort West:—Messrs. C. M. Weeber and C. D. Davis.
Britstown:—Mr. Z. B. Grové.
Caledon:—Messrs. C. J. Human and P. H. Swart.
Cape Stud Breeders Association:—Mr. C. G. Lee.
Ceres:—Mr. D. J. Joubert.

Constantia:—Messrs. R. Cloete, J. Malan and W. H. Lategan.
Cradock:—The hon. P. W. Michau, M.L.C., Messrs. M. J. du Plessis, M.L.A., H. C. van Heerden, M.L.A. and James Butler.
Darling:—Mr. W. F. Duckitt.
East London:—Mr. W. A. Edmonds.
Graaff-Reinet:—Mr. G. H. Maasdorp, M.L.A.
Griqualand East:—Mr. C. R. Rennie, M.L.A.
Humansdorp:—Messrs. J. M. Rademeyer, M.L.A., and M. P. Zondagh, M.L.A.
King William's Town:—Mr. A. P. Everitt
Koonap:—Mr. Frank Douglass, M.L.A
Middelburg (Cape):—Messrs R. H. Struben, J. S. Minnaar, W. P. Stahl, and Charles Southey.
Molteno:—Mr. C. A. Pope
Oudtshoorn:—Messrs. E. T L Edmeades, A. L. Matthews and J. F. Kirsten.
Paarl:—Messrs. C. W. H. Köhler and J. Starke
Port Elizabeth:—Messrs. A Guthrie, C. Mackay and J. Woodin
Queenstown:—Messrs. C. R Arnold and C P. Hill.
Robertson:—Messrs. D J. de Wet, W. Wessels and J. C. Neethling.
Stellenbosch:—Messrs. E. Lange, R. J. Bulmer, J. W. H. Roux, J. P. Louw, W. A. Krige, C Neethling and P. R. Malleson.
Western Province Agricultural Society:—Messrs. J. C. Faure, P. A Myburgh, R. Starke, L. Cloete and Col. W E Stanford, M L.A.
Wellington:—Mr. S. W. Joubert.
Wodehouse:—Mr. C. S. Vermooten, M.L.A.
Worcester:—Messrs. A. N. P. du Toit, P. R. Rabie and C. Heatlie.
Hon. Secretary:—Mr. F. D. MacDermott.

The President, at the outset, expressed his gratification at the presence there that morning of the Minister for Agriculture, a circumstance which spoke of the sympathetic feeling which existed on the part of the Agricultural Department. In Mr. Malan's presence there, they felt they had the assurance that the Government identified itself with the movement of self-help, which was carried on by the Agricultural Union. (Hear, hear)

THE MINISTER FOR AGRICULTURE,

The hon. F. S. Malan, M.L.A., who rose mid cheers, said that it gave him very great pleasure to welcome them all to Cape Town, and to see that their presence there had also been noticed by the City Fathers, for they had there the Mayor and Mr. Jagger, the President of the Chamber of Commerce. He thought that that was as it should be. The gathering of a Congress like that gave an opportunity of surveying the work of the past twelve months, and when he looked at the agricultural position of the country to-day, compared it with what it was twelve months ago he found that there was a bright side and a dark side to the picture. He would come to the bright side first, and he would say in that connection that he believed there now existed a better appreciation of the

PRINCIPLE OF SELF-HELP

amongst the farming community. (Hear, hear.) But he thought there was also a better discrimination as to the functions of the private individual and the work of the Government. In the past, people had come to the Government for doles, and it had not been realised sufficiently

where the functions of the Government should begin and where they should end. He thought that the two main directions in which the Government should help were by assisting in the organisation of the farmers; and, secondly, in private education—(hear, hear)—and he thought that the Government might do more than had been done in the direction of education, not only in the education of the young and in giving facilities for the studying of agricultural problems, but also in the form of giving advice to the grown-up farmers, because, with the scientific development that was going on, unless the South African farmers were prepared to advance with the times, South Africa was not going to progress as it should do. (Hear, hear.) He found that during the past twelve months there had been a very marked increase in the production and export of agricultural produce in South Africa, more particularly in the Cape Colony. He found, too, that that was more particularly noticeable in two directions, viz., ostrich feathers and maize. As regards ostrich feathers, the industry was assuming such vast proportions in South Africa that he thought the Governments would be wise to take a little more notice of the industry. (Hear, hear.) He had seen that at one of the meetings of farmers, recently held, an attack had been made on the Agricultural Department, and more particularly on himself, in connection with the lending of an expert to Natal. He had been sorry to hear, especially when they were on the eve of Union, that there should be such a petty spirit in existence, and he maintained that, if they were going to advance in South Africa, they would have to look upon their industries from

THE UNION POINT OF VIEW

and from the South African point of view. (Hear, hear.) He thought that the facilities given by the different railway administrations in connection with the export of maize were working more or less satisfactorily. It was true that there had been a set-back, which was due, to a certain extent, to the fact that there was some late maize, and the season generally was a little later than usual. The producers, however, had warned the merchants, and had said that they must delay acceptance for a few weeks, but the reply was that immediate delivery must be made, with the result that some maize which was not quite dry was delivered. That, at any rate, was the explanation which had been suggested to him. Then there had also been a great advance in mixed farming, and during the year an Irrigation Congress had been held at Robertson, the first in South Africa. At that Congress the papers read and the spirit displayed augured well, he considered, for the future of South Africa. He would also say that there was a good sign noticeable in regard to the greater interest which was now being taken in

AGRICULTURAL EDUCATION.

They saw that clearly when they looked at the full quota of pupils at Elsenburg, where a few years ago they could not get more than 20 or 30 students, whilst to-day they had the full limit of 60, and the classes were all full. Proceeding, Mr. Malan referred to a motion on the Assembly paper for that afternoon with reference to the establishment of an Agricultural College in the Eastern or Midland district, a matter to which, he said, the Government, and he himself particularly, had given very considerable attention, and in respect of which they would be quite ready to receive any practical suggestions which might be made. (Hear, hear.) If they had not much money at present to start the thing, they must have their ideas, at any rate, ready, for if they had no ideas

ready to be worked out in the near future, they would be left behind. (Hear, hear.) There was also, as he had said, the dark side to the picture, and the dark side was,

EAST COAST FEVER

which was causing the Government and the people of the country a great deal of anxiety. They were doing what they could in the matter, and up to the present, although the disease was on the Colonial borders, they had been successful, as far as they knew, in keeping it out. In connection with that campaign, the Government had laid down two principles. The one was that where they constructed a fence, it should be of some permanent value, and not a mere rinderpest fence, which was to be taken down and thrown away. Fencing in South Africa was a good thing in itself, and, therefore, if they had to construct a fence they should construct a good one The second principle which they had laid down was to fight the tick, because the tick was the medium by which the disease was communicated, and, apart from that, the tick was a pest in itself. (Hear, hear.) He thought, in fact, that the day was not far off when they ought to have a permissive compulsory cleansing Act, not only along the public roads, but so that every farmer should clean his flock, and, in any case, unless they fought the tick wherever it appeared in South Africa they were never going to make a success of their dairy industry. (Hear, hear) The matter of East Coast fever was in reality a Union matter and by spending one pound more now they might be able to save £5, or even £100, to the Union afterwards He saw a telegram in the papers that morning which had alarmed him. It was in connection with the cattle disease in Natal, and it seemed to him that unfortunately the disease was allowed to spread in Natal to rather an alarming extent. Coming to

THE WINE INDUSTRY

he said that was another dark spot, and that he was sorry to see that some people at present had very little sympathy with the wine-farmers, and seemed to think that the sooner one could suppress them the better; and that spirit seemed to be reflected to a certain extent in the larger centres of population. If that were the spirit, he would say it was not the right one. The day would come when they would be thankful that there was such a place as the Western Province where the people were permanently settled on the soil in something like closer settlement. The wine industry, if properly cared for, was one of the biggest assets South Africa had, and he was sorry to see that that fact had not been sufficiently realised in the past. (Hear, hear.) In that respect he hoped that the Congress and Parliament would see to it that there was a better day coming for the wine industry—the poor wine industry. Referring to

AGRICULTURAL SHOWS

Mr. Malan said that the Government and Parliament had seen fit to cut down the grants very considerably indeed. In 1906-07 the grant had been £13,000; in the following year, £5,000; the previous year, £3,000; and that year, £3,000. He regretted it more than he could say that that was the case, but as matters stood at the present moment, he thought that they had to think twice before they could increase that amount. If the smallness of that amount would induce some of the societies to combine and hold one show where two had been held, he thought that would be the bright side of that picture.

CLOSER UNION IN AGRICULTURE.

There was another thing which interested him particularly with regard to the agenda, and that was the matter of organisation. In August the Conference at Bedford had come to a decision contained in a series of resolutions which he understood would be discussed by them at that Congress. He hoped that they would give the matter their careful consideration. He had written a letter in connection with that Closer Union scheme, which he hoped would be laid before the Congress. He was not going into details now, but he hoped that they would give the letter their careful consideration. Generally, it seemed to him that the weak point of the scheme for the proposed closer union of their associations was that they had not taken Union, or the new situation which would be created under Union, sufficiently into consideration. He believed that the scheme was a workable one, and it was a good thing to make a beginning with. If, before they entered into Union and that new phase of South African development, they could put their house, even in Cape Colony, in order, he believed that their Congress would have done a great service to the country. In conclusion, he would like to say that the officers of the Agricultural Department in Cape Town would be at their service. The Under Secretary for Agriculture and the Chief Veterinary Surgeon had been at East Coast fever work in the territories, and would come back the following day. He hoped that their Congress would be successful and that its members would devote their attention to the practical side of agriculture and its development; and in that way they would lay that basis of national welfare, without which the country could never prosper. (Applause.)

The Chairman said that he was pleased to see the Mayor present, and called upon him to say a few words.

THE MAYOR'S WELCOME.

The Mayor said that it was a great privilege in the name of the citizens of Cape Town to extend a sincere and warm welcome to the Congress. He had glanced at their agenda, and it seemed to him that there were some very knotty points which they had to consider. He hoped that the Congress would find a speedy issue out of all their troubles. (Applause.)

COMMERCE AND AGRICULTURE.

Mr. J. W. Jagger, M.L.A., president of the Chamber of Commerce, said that he was very pleased to extend a very warm welcome to them. As to what had been said about organisation, he would like to point out that the merchants had an organisation, and they knew what benefit it did to them. It was often said that the interests of the mercantile community and those of the farmers were closely connected; if that were so he might say it was more so in connection with Cape Town than any other large centre in South Africa—(A Voice: "No.")—because in Cape Town they had no mines to serve, but an agricultural community and a farming community not extending further than Beaufort West. Perhaps the most active body in the Chamber was the Produce Trades Committee, composed of gentlemen who bought and sold Colonial products. Dealing with the question of the set-back in the export of Colonial mealies, he thought that it had been much exaggerated. He had made very careful inquiries in their own Chamber of Commerce, and he found that no export from Cape Town had been rejected by the buyers on the other side. As to efforts which were made to abolish the middleman, he always smiled when he

heard of them. He had been over 35 years in that business, and he had known of several of such attempts, which had always proved futile, because the middleman or merchant performed

A VERY USEFUL FUNCTION.

The work of the merchant was to find markets for the products which they (the farmers) produced. He thought they would be astonished if they knew the amount of money which merchants of the city had spent to find new markets, and he included wine merchants. He put it to them as common-sense men: What farmer, what producer was in a position to do that? The farmers had to produce a good marketable commodity, and not only that, but produce it in quantities Small sample lots were no good to merchants. What the merchant wanted was continuity of supply. They could certainly rely upon the merchants being only too willing and anxious to buy and to export the farmers' produce oversea if a good article were supplied and the supply were regularly kept up. They also wanted them to assist them in a matter which had been before the mercantile community for some time, i e, to urge upon the Government the great importance of supplying

STATISTICS RELATING TO AGRICULTURE

He referred to what other countries, notably the United States of America, had done in that respect, and said that if the Governments of these countries thought it worth while to supply those exhaustive statistics, he thought it should be done here as well. In the end, the want of these statistics reacted upon the farmers themselves. A knowledge of these figures must be of advantage to the farmers. The want of these statistics was as much a detriment, and even more to the detriment of farmers, than to the merchants themselves. (Cheers.)

The Chairman thanked the Secretary for Agriculture, the Mayor and Mr. Jagger for their addresses. He would like to say that the Union felt that there was a desire on the part of merchants to come as near as possible to the farming community, and they hoped that that would be productive of great good. They were greatly encouraged to see Mr. Malan amongst them, which showed that the Government remained, and purposed to remain, in close touch with the farmers. (Hear, hear.)

THE ANNUAL REPORT.

The business of the Congress was then proceeded with.

The annual report of the Executive Committee of the Union was read. It was in the following terms:—

Gentlemen,—In presenting their annual report for the year 1908-9, your executive feels that the agricultural community generally is to be heartily congratulated upon the improved conditions brought about by the copious rains which have fallen throughout the country, and the better outlook which has supervened. The farm stock of the Colony has not only increased, but there are notable advances in condition and quality, while our agriculturists are looking forward to good crops.

The one disturbing feature is the continued depression which hangs over the viticultural industry. This is the more regrettable, because this industry has in the past maintained more people on the land than any other form of farming in South Africa. It is sincerely to be hoped that

this depression will soon pass away, and that in the immediate future something may be done to relieve the sorely-pressed wine-farmers. In all other sections of cultural enterprise your committee is pleased to note gradual and solid progress.

The Agricultural Department, to which the farmers of this Colony owe a deep debt of gratitude, has continued its liberal policy of assisting all who are desirous of help to improve their methods, both by instructions and demonstration. The system of co-operative experiments has done much to bring to the notice of farmers the value of introduced grasses and forage crops. The latter, in turn, are bringing increased profits to those who have taken advantage of the knowledge thus easily acquired. In other directions, too, the Department is taking the deepest practical interest in our affairs, and your committee would urge all agriculturists and pastoralists, who desire to improve their methods and add to their incomes, to not only study the results of the eminently practical experiments carried on by the Department from season to season, but to assist the departmental officers in this work by applying for the seeds, manures, etc., so freely offered, and carry out experiments for themselves on the lines of the careful instructions supplied.

Another feature for congratulation is the progress to be noted in the conservation of water and increased interest in irrigation. Enterprising farmers all over the country are now giving their attention to these matters, and are meeting with unqualified success.

Your committee is convinced that these are the true lines upon which this country should be developed. Enterprise and hard work, combined with sound practice, will yet produce miracles in South African agriculture. Our only need now is wider markets, and for these we must look oversea.

The recent developments of the export of maize give some indication as to what the future may contain. And this, we must remember, is but a drop in the ocean. Many of our farming industries are capable of indefinite expansion. As these grow, as there seems every indication that they will, the day must arrive, and that soon we hope, when agriculture will take its rightful place in the economy of United South Africa, and become the pride and support of the whole of its people. Minerals will have their day, but the ultimate future lies with the farmers; they have but to realise their duties, their responsibilities, and their own best interests, and all must come right

In the final passing of the Act of Union, your committee sees further cause for congratulation, and desires to place on record its high appreciation of the statemanship which prompted that movement. At the same time we may all fervently hope that the consummation of that great work may bring lasting benefits to the whole of our people.

Your committee regrets exceedingly that this Congress could not have been held earlier, and that it had to be postponed from the date originally fixed. This was unavoidable owing to the holding of the S.A. Irrigation Congress, and the negotiations on the subject of Closer Union with the other agricultural bodies of this Colony being then pending. These negotiations resulted in the Conference held recently at Bedford, called by the Central Association on a resolution of the Farmers' Congress. The report of this Conference and the recommendations will be placed before you for consideration and decision.

Since our last Congress this Union has sustained very serious loss by the death of two of its prominent members. The late Mr. T. P. Theron, so widely known and respected throughout South Africa, was one of our soundest friends. As a member of the executive and as an honorary vice-president, his wide knowledge of affairs and ripe judgment were always at our disposal. His place will be difficult to fill. The late Mr. D. M. Hugo, of Nuy, was one of our younger colleagues, full of enthusiasm and an

untiring worker. As a member of the executive, his presence has also been greatly missed. To the friends and relatives of both these genlemen we tender our deepest sympathies.

Your committee welcomes on your behalf the presence of the members of the Western Province Vine and Fruit Growers' Congress. This joint convention, it is to be hoped, may prove a happy augury, as forecasting the end of the dissipation of energy which has gone on in the past.

Owing to financial restrictions and other causes, the executive has enjoyed few opportunities of meeting in full session during the past year, but the work has been kept going satisfactorily by means of correspondence and circulars. This has involved a great deal of work on the secretary, but as it was the only method of getting through, he cheerfully carried it out. The most important work of the recess was that of interesting the Colony in the formation of the judges' section. This was undertaken by the secretary, in conjunction with different members of the executive. Several meetings were held, and representative bodies approached by circular, with gratifying results. These will be laid before you, and a committee asked for to draft a constitution, when it is hoped the scheme will be successfully floated.

Show dates is still a vexed question, and will be, it is feared, until this Union can secure more power to enforce its recommendations. This subject will also be submitted for discussion.

Two Congresses of the Inter-Colonial Agricultural Union have been held during the recess, the one at Bloemfontein in 1908, and the other at Durban at the beginning of the present month Your Union was fully represented on each occasion, and much good work accomplished. Reports of the Bloemfontein Conference have been circulated, and copies are on the table The report of the Durban Conference has not yet been issued.

In spite of the depression and financial restrictions, your committee is pleased to be able to report that the accounts of the Union are in a sound position. Economics have been necessary in order to husband our resources, but every effort has been made to obviate any hampering of the more important work of the Union. The position to-day, as will be seen from the hon. treasurer's statements laid on the table, is eminently satisfactory, considering how serious the position might have been with the restrictions so suddenly imposed at the beginning of the financial year

PRESIDENTIAL ADDRESS.

The President, in moving the adoption of the report, said: It is my privilege to welcome the degelates to this, the twelfth annual Congress of this Union, and I do so feeling that an organisation such as this is year by year becoming more necessary, because it is a means of protecting all that has already been secured for agriculture, so that nothing good be lost, and, further, it is a medium to assist us in proclaiming a sound and acceptable policy for further development. It is here where the best in the land have an opportunity of taking counsel together, because this Union collects representatives of every branch of agriculture in the country, as well as many in other walks of life, who are deeply interested in agricultural advancement. All these can assemble here, quite regardless of their party political convictions, to co-operate in securing and promoting the interest upon which our national life stands. If there are any who think this asserting too much, let them try to think out the position of this country with each branch of agriculture divided off from the rest, all acting in separate groups, isolating themselves, and fighting on for their own, perfectly regardless of the general national welfare. If every party politician condemned this Union's round-table councils—such a course of action is too unthinkably absurd to seriously consider. Although this Union has done much towards fostering

A SPIRIT OF CO-OPERATION,

let us all beware of sinking down into a method of merely passing pious resolutions as to how things should be done, or re-affirming previous resolutions as to how the Government should do things. It almost goes without saying such a course has its uses, but apart from this, we must ever strive to take up a wider field of self-help, that will make this organisation of growing direct pecuniary benefit and practical use to every man and woman upon the land I am not complaining about our past; much has been done under difficult circumstances, but at no time must one opportunity be lost to maintain and push forward practical activity. The work that lies before this Union is perfectly clear (1) We must consistently and constantly direct efforts towards making the soil more productive, by supporting a greater number of stock and yielding heavier crops of grain and fruits, while encouraging at all times the production of the highest quality even at the expense of quantity. (2) We must ever seek to co-work with others in scientifically fitting a greater number of our people to occupy the land, thereby making farm life more attractive to the well-to-do classes, and check the flow now augmenting the ranks of the poor whites, and endeavour to direct such to grow up into wealthier whites, at the same time qualifying everyone who wishes to take up agriculture. This may seem a tall order—but at least a serious beginning can be made to attain these ideals—by gradually introducing

NATURE STUDY IN ALL SCHOOLS,

followed by optional courses of technical training that will tend to make farm life more profitable and more attractive to our boys and girls as they grow up. We as farmers, I know, feel diffident about trespassing on the ground that for long past has erroneously been looked upon as exclusively belonging to the educationalist We may express ourselves awkwardly perhaps, but the more we, as farmers, interest ourselves, the more we see the need of education, and the more determined will we be to take the fullest advantage of scientific education. Furthermore, we have at our disposal the best possible machinery for carrying on the work of disseminating light and knowledge upon advanced methods in agriculture amongst those who have passed the schooling age but who need help. This machinery consists of our agricultural societies, who can do a very great deal more to make our agricultural shows of greater educative value, but in this we want encouragement by the Railway Department carrying *bona-fide* show visitors at the lowest possible rate. (Hear, hear.) It is not my intention to take up your time with a long address. What I said in my last year's address stands good to-day, with the exceptions referred to in your executive's report. Although very much might be said in support of the work you have in hand, especially at this Congress, where there will be need to show a spirit of South Africanism in all we undertake, but I am sure all your discussions will be carried on, as usual, with that broadmindedness that has always characterised our meetings. (Applause.)

The Congress then adjourned until 2 p.m.

AFTERNOON SESSION.

The proceedings were resumed at 2 o'clock.

Mr. Kohler pointed out that the Congress was held in conjunction with the Western Province Vine and Fruit Growers' Congress. There had been an effort to effect amalgamation of the several organisations of farmers in

the Colony, but as this was found not to be feasible, the Fruit Growers' Associations had joined with the Union, and resolutions would be submitted by that body at the Congress. He hoped the ultimate effect of this would be a formal union of the two organisations. (Hear, hear).

HOURS OF SITTING.

It was decided that the hours of sitting be from 9 to 12.30, and from 2 to 6, an amendment providing for night sittings having been negatived.

WOMEN'S CHRISTIAN TEMPERANCE UNION.

A letter was received from the Women's Christian Temperance Union, asking the Congress whether it would be agreeable to meet or receive a deputation from the Union.

Resolved that the matter stand in abeyance, pending information on the point.

SHOW DATES FOR 1910.

The Executive submitted the application for show dates for the 1910 season which had come to hand, and suggested they be referred to a committee.

Mr. Kohler moved that the Committee consist of Messrs Persse, Woodin, Hill, and Minnaar, and that the report be presented at 4 p.m. This was carried.

Mr. C. R. Arnold moved: "That one of the many objects of this Congress being to fix dates for Agricultural Shows, it is of opinion that all affiliated societies having dates allotted to them should do their utmost to adhere to such dates." Seconded by Mr. Hill and carried.

GOVERNMENT GRANTS TOWARDS AGRICULTURAL SHOWS.

Mr. J. C. Neethling proposed that Government be requested to support as many Agricultural Societies as possible, and that the usual five-eighths grant be reduced to one-third, this amount to be granted to all Societies than can hold their shows on that. Discussion proceeded, when the motion was withdrawn.

PRIZES AT SHOWS FOR VELD-REARED ANIMALS ONLY.

The Executive submitted correspondence which had passed with the Agricultural Department on a proposal put forward by the Hon. Dr. Smartt, M.L.A., that prizes at Agricultural Shows for animals should be limited to those not artificially fed or housed, the proposal being put forward in connection with cattle and sheep only. After discussion:

Mr. C. R. Arnold moved: "That in the opinion of this Congress such a regulation would be inadvisable and unworkable, and that the decision arrived at by the meeting held at the King William's Town Agricultural Show last year, viz., that housed and unhoused sheep should be treated equally in separate classes be accepted by this Congress. Further that as regards artificial feeding, restrictions are to be deprecated as against the best interests of stock-farming, but where considered advisable, separate classes for artificially fed stock might be established." Seconded by Mr. Edmonds and carried.

Limiting Prizes at Shows.

The Executive submitted correspondence with the Agricultural Department in connectoin with the following resolution of the Select Committee of the House of Assembly on the Estimates: "That prizes in connection with Agricultural Shows should only be given at two shows for the same animal or article, and that, as far as possible, such prizes should take the form of medals instead of money."

Mr. Myburgh moved, seconded by Mr. Edmeades: "That the recommendation submitted by the Executive in 1907 on this subject be reaffirmed." This recommendation reads:—That the Government be advised that in the opinion of the Executive of the Agricultural Union no single exhibit should be allowed to draw money prizes towards which the Government Grant contributes at more than three separate shows in one season, but that provision may be made by which any such exhibit competing at any show, after having won at three previous shows during the same season. may be placed in its order of merit and be awarded such recognition as the Society concerned may think fit. This recommendation not to apply to machinery and implements for agricultural purposes. The above resolution was carried unanimously.

Report of Committee on Show Dates, 1910.

The report of the Committee on Show Dates was then submitted as under:—

Your Committee submits herewith a list of Show Dates recommended for the Season 1910. For the convenience of delegates the whole show area has been divided into three sections, viz.: (1) Western Province Shows; (2) Midland Shows; (3) Eastern and Border Shows.

Your Committee begs to suggest that owing to the difficulties experienced in the past in the allotment of show dates, a Standing Committee be appointed for the sole purpose of arranging show dates, and that it be an instruction to this Committee to take the matter in hand at the close of each show season for the ensuing year.

The following are the dates recommended:—

Western Shows:—

Paarl.—Last week in January.
Stellenbosch.—Thursday, February 3.
Bredasdorp.—
Robertson.—Wednesday, February 9.
Malmesbury.—Thursday, February 17.
Caledon.—
Beaufort West.—Thursday or Friday, February 17 and 18.
Rosebank (W.P.).—Tuesday. Wednesday, Thursday and Friday, February 22, 23, 24 and 25.

Midland Shows:—

Graaff-Reinet.—Tuesday and Wednesday, March 1 and 2.
Middelburg, Thursday and Friday, March 3 and 4.
Cradock.—Tuesday and Wednesday, March 8 and 9.
Grahamstown.—Thursday and Friday, March 10 and 11.
Port Elizabeth.—Tuesday, Wednesday, Thursday and Friday, March 15 16, 17 and 18.
Humansdorp.—Wednesday and Thursday, March 23 and 24.

Eastern and Border Shows:—

Queenstown.—Tuesday and Wednesday, February 15 and 16.
Molteno.—Wednesday and Thursday, February 23 and 24.
Aliwal North.—Tuesday and Wednesday, March 1 and 2.
Dordrecht.—Friday and Saturday, March 4 and 5.
Cathcart.—Tuesday and Wednesday, March 8 and 9.
East London.—Wednesday and Thursday, March 9 and 10.

Mr. Persse added the following note:—The Western Province representative would like to submit that it has always been the practice to commence the Rosebank Show on the last Tuesday in February. In 1911 the last Tuesday in February will be the 28th, and it is suggested that in framing the fixtures for the 1911 season this matter should be borne in mind.

Mr Cloete proposed the adoption of the report. Seconded by Mr. Mackay, and carried.

On the motion of Mr Arnold, it was resolved that the standing Committee on Show Dates be Messrs Persse, Hill, Minnaar, Woodin, and the Secretary of the Union

CATERING AT SHOWS—SOUTH AFRICAN PRODUCTS.

The Executive submitted a letter from the Minister for Agriculture covering a communication addressed to him by Dr. J. H Meiring Beck, M L.A., urging the greater use of South African products in the catering departments at Agricultural Shows The Minister for Agriculture asked for the question to be fully ventilated at the Congress, and to be furnished in due course with the result of the discussion All Agricultural Societies are also being circularised with a view to the matter being adequately discussed.

Dr. Beck's letter, which was addressed to Mr Malan personally, was read as under:—

With reference to our conversation a few days ago, I venture to submit the following suggestions:—

Our Agricultural Shows are or ought to be essentially organised for two purposes:

A. The encouragement and improvement, through competitors, of Agricultural Production in South Africa

B The spread of information, as regards the Country's products, and the use they can be put to

In one respect infinitely more can be done than is being done

I refer to the *Catering* Department

Nothing more unorganised or haphazard exists than the manner in which at Shows throughout South Africa, catering for refreshments is carried out.

In this direction there are great opportunities for bringing a great many essentially South African products to public notice. At present A, B. or C. tenders, often at the last moment, for the supply of refreshments in the Show Yards. A few hours before the Show opens, he arranges an impromptu bar, very uncomfortable often, and generally rough and uninviting Here he dispenses liquid and other refreshments, at rates uncontrolled by the Show Committees, refreshments procured in many instances from every place under the sun except South Africa.

I venture to suggest that the time has come when an organised feature of our Agricultural Shows, if they really propose to do what they exist for, should be, to demonstrate not only what excellent South African products exist, but the many practical uses they can be put to. We should show what our country can do, not what other countries can do

Steps should be taken to erect in each important Show Yard throughout South Africa a properly designed and suitable refreshment kiosk, if possible from Colonial woods, etc Small tables should be placed round and about this kiosk where visitors can refresh in comfort, as they can do everywhere else in the world but in South Africa on these occasions.

The caterer should be carefully selected, probably some one acquainted with the way things are done on the Continent of Europe (and there are many available in all large towns) would be preferable. These kiosks should sell at fixed and moderate rates, only South African things, and should be stocked with natural wines and spirits bearing *producers'* names, Colonial Aerated waters, beers, guaranteed to have been brewed from Colonial malt, Natal teas, and so far as possible, South African foods, fruits, and cigarettes, etc., from South African Tobaccos.

I am certain your Department would not have the least difficulty in supplying information as to suitable places or individuals from whom direct or indirect supplies could be obtained There are at present more than enough sources of supply available.

A great feature of the thing could be, on the invariably hot Show days, light and palatable drinks made from our wines, aerated waters and fruit. (The Continental

"Bowle" so much everywhere used in Europe.) Imagine on a hot day, a cool well iced Pine Apple, or strawberry or peach cup, made of fruit, our white wines and aerated waters, iced well and flavoured to suit particular palates. They could be sipped like American drinks or lemon squashes through straws, and might become popular from one end of South Africa to another.

It is horrible to think how little real use is made in South Africa of the good things the Gods provide and Agricultural Committees have a great opportunity.

Recipes for various cups, cakes and other things could very well be printed for distribution to visitors who, remember, come from all parts of South Africa, and who would thus, in a practical way, be brought into contact with their own country's products, easily procurable, but largely unknown, unconsidered and unused.

You will, I am sure, at once see, where such an idea, properly developed, might lead to. If adopted all over South Africa as time goes on, what may the results not be?

There are no practical difficulties. I know caterers like Kamp, etc., in Cape Town who would with timely notice arrange the whole thing without the slightest trouble to the Show people, beyond co-operation and provision of accommodation.

To a large extent something of the same sort might be done on our State Railways, and our subsidised mail boats. I have often wondered why on the hot journeys through the Karoo, or the Tropics, more use is not made, and more publicity given to the excellent things that could be manufactured out of our fruits and wines, and why a special point is not made of supplying South African things, like Natal teas, etc.

The tariff for these things should of course be fixed as moderately as possible.

I am writing in haste, and have merely jotted down a couple of hurried thoughts, perhaps you may think it worth while to consider the suggestions and to interest yourself.—Yours, etc.,

(Sgd.) J. H. M. Beck.

Mr. Fitchat moved, seconded by Mr. Edmeades, that Dr. Beck's letter be printed in the Minutes of Congress, and that it be recommended to the favourable consideration of all Agricultural Societies. Carried unanimously.

Formation of a Judges' Section.

The Executive submitted correspondence and report on what had been done in the matter of organising a Judges' Section, and recommended that the Congress appoint a Provisional Committee to draft a constitution for this section, such Committee to report before Congress rises.

Mr. Hill proposed, seconded by Mr. R. Starke, that the following Committee be appointed: Messrs. Fuller, Edmeades, Persse, Everitt, Minnaar, Struben, P. Rabie, J. Starke, Stephen Smith, N. E. Smuts, and the Chairman.

A motion by the Bayville delegate that the Judges' Section, when formed, shall include judges of farm produce, was referred as a recommendation to this Committee.

Agricultural Organisation.

Mr. Edmeades moved that the next subject on the agenda, the Report on Agricultural Organisation, be taken with precedence the following morning Carried.

Amendment of Rules.

Mr. N. E. Smuts moved that rule 12 be amended in order to give a greater equality of voting power. To this end he proposed that societies with a membership of fifty should send one delegate to Congress, over fifty and up to one hundred to send two delegates, and over one hundred three delegates.

After some discussion, Mr. Edmeades moved that Congress proceed to the next business. Seconded by Mr. Minnaar, and carried.

Mr. Struben moved, in accordance with notice given by the Executive: "That rule 7 be amended in the following manner: In the last line but one the word 'Treasurer' to be omitted and the word 'Secretary' be substituted; and in the last line all the words after 'by the' be omitted and the following substituted: 'Treasurer of the Union, or, in his absence, by the President, or one of the two Vice-Presidents.'" Seconded by Mr. Fitchat and carried.

Field Botanist and Plant Pathologist.

The President asked the Hon. A. J. Fuller to take the chair while he moved two resolutions down in his name. This having been done, he moved: "That this Union would again urge upon the Government the pressing necessity of appointing at the earliest opportunity a Field Botanist on the Technical Staff of the Agricultural Department. Also that a Mycologist and Plant Pathologist is urgently needed for investigation purposes."

Mr. Malleson seconded. Carried.

Nature Study in Schools.

The President next moved: "That as a first step towards scientific agricultural education, every encouragement should be given to Nature Studies in the schools. Seconded by Mr. P. R. Malleson, and carried.

Agricultural College in the East.

Mr. C. R. Arnold moved: "That this Congress reaffirms the resolution passed last year favouring the establishment of an Agricultural College in the Eastern Province, and earnestly requests the Government to take steps in this matter." Mr. N. E. Smuts seconded.

At this stage the debate was adjourned, and Congress adjourned until the following morning at 9 o'clock.

(To be Continued.)

ALMERIA GRAPES AND THEIR CULTIVATION.

The Trades Commissioner in London, Mr. C. du P. Chiappini, has been making very full enquiries as to the cultivation of Almeria grapes. In the course of this he approached the British Vice-Consul at Cordoba in June last, asking for certain specified information in the following terms: —

In connection with certain enquiries now being made by my Government, I will be much obliged if you can supply me with the following information: —

1. The quantity in barrels of Almeria Grapes shipped from the different Provinces in Spain to all ports of the world during the season ending December, 1908?

2. The names of the principal varieties of Almeria Grapes, with a brief comment indicating the varieties which are found most suitable for export, or which possess the quality of keeping to the greatest extent?

3. With reference to the conditions under which the grapes are grown, can you kindly state: —

(*a*) What is the nature of the soil? Is it clay, gravel, loamy, or otherwise?

(*b*) Is irrigation necessary, and does it in any way affect the grapes in so far as their keeping qualities are concerned?

(*c*) Are the grapes grown on trellises, or on shrubs, or on stakes?

(*d*) What are the most favourable aspects, and what are the altitudes at which the grapes are grown?

(*e*) What is the usual average temperature, and the usual average rainfall in the districts where the best grapes are grown?

5. With regard to the packing, can you please tell me · —

(*a*) Where do the growers in Spain get their barrels from, and approximately the cost?

(*b*) Where do they get their cork dust from, and approximately the cost?

(*c*) Is it possible for the people in South Africa to import either the corkdust or the barrels from Spain?

I am assuming that to obtain the above information will not cause you much trouble, and would therefore ask you to be good enough to let me have a reply at your earliest convenience. Will you also kindly treat this matter as private and confidential.—I have, etc.,

C. Du P. Chiappini,

Trades Commissioner.

To R. E. Carr, Esq., His Britannic Majesty's Vice-Consul, Cordoba, Spain.

To this the British Vice-Consul replied as under:—

In reply to the queries in your favour of 4th instant, I have much pleasure to give you the following answers, viz.: —

1st. There were shipped from the port of Almeria during season 1908 (from 21st July to 22nd November—one steamer sailed on 1st December with 1,170 barrels), 1,609,270 whole barrels and 16,656 half

barrels, with a total net weight of say 32,455 tons. In the Consular Report for the Malaga district you will find full particulars of the distribution of this fruit.

2nd. Since the Phylloxera scourge, which over-ran the whole Province during the early nineties, the growers have used American plants on which they graft the Chanes or Almeria grapes. It was from the village called Chanes, near the northern confines of the Province, that the first grapes were sent to the market from 55 to 60 years ago, and from that circumstance the grape, which in time came to be planted all over the district, is known by the name of "Chanes" The American plants chiefly favoured are named Rupestris Lot, Riparia Aramon, Rupestris Ganzin, and others.

The grapes shipped in the end of July and beginning of August are all of the Castiza classes, the two chief kinds being "Molinera" and "Rosada" From 70,000 to 100,000 barrels of these are sent off yearly. They are not a keeping grape and are simply sent to catch the early market. The white or keeping grape is sent away from, say, the 10th August onwards As already stated this white class is known by the name of the Chanes or Almeria Grape

3rd. (*a*) Throughout the Province there are a variety of soils, but the best qualities of grapes are produced from a gravelly soil

(*b*) At least three irrigations a year are necessary. If the plants get too much irrigation after being nearly ripe they do not keep.

(*c*) Please refer to pages 12 and 13 of the Consular Report, Annual Series, No. 3,644, where full particulars will be found. The poles therein referred to measure from 6 to 9 centimetres diameter at the small end. As to galvanised wire, the best comes from England. It is made up in rolls of 11½ kilo-grammes and 4 of these are again tied up in coils making 46 kilos. The sizes of wire required are No. 7, 8, 10 and 14 B.W.G. One of the firms which has for a number of years supplied the best wire is that of Richard Johnson & Nephew, Ltd., Bradford Works, Manchester. It is far superior to any Spanish or German wire. (Note by Trades Commissioner:—I have written for and obtained prices and samples of the wire.)

(*d*) The grapes are grown up to altitudes of, say, 3,000 feet above sea level. It is no doubt due to the special climatic conditions of the district that these grapes can so well be reared and matured.

(*e*) In a standard work the average temperature is given as 15° centigrade (59° Fahr.)—maximum 40° (104° Fahr.) and minimum 5° (41° Fahr.) for the Northern part, and for the Southern 18° (64.4° Fahr.) average, with 43° (109·4° Fahr.) as maximum, and that it rarely goes under 0 (Freezing point). It is, however, a fact that we have quite frequently touches of frost about February, sufficient at times to destroy the potatoes. For the rainfall, see Consular Reports for the years 1905, 1906, 1907 and 1908. (Note by Trades Commissioner:—See Table of Rainfall marked A annexed hereto.)

4th. (*a*) All barrels are made in the locality, the construction of which provides work for a large number of men and boys. They are chiefly made of Oak and Pine wood. The *latter* is brought from the West Coast of Spain and other parts of the country and from Portugal, while the former is imported from New Orleans—part direct and part *via* Liverpool. Chestnut, beech and other woods are also used. The hoops for the barrels are brought from the North of Spain, from the Barcelona district, and occasionally from Italy.

The average prices of the pine barrels may be set down at 1s. 7d. to 1s. 10d., and those of the oak barrels at 1s. 10d. to 2s. 6d. each, including the necessary quantity of ground cork. Besides the ordinary barrel a drum is used. All particulars regarding this drum could be had from

the Guelph Patent Cask Co., Ltd., Deptford Ferry Road. Milwall, London. A man and two boys working on one of this Company's machines by hand can turn out easily 120 drums per day.

(Note by Trades Commissioner.—I have written for and obtained prices and samples of drums.)

(*b*) The ground cork for packing comes chiefly from Puente Mayorga and Algeciras in the neighbourhood of Gibraltar, from Seville and from San Feliu near Barcelona Its general price runs about £8 per ton in store here. A part of the cork is brought from the producing centres in sheets (inferior quality) and cuttings, and ground in the district

(Note by Trades Commissioner:—Ground cork can be delivered in Cape Town c i.f., at £10 per ton, 1s. per lb ; 5 lbs. are required to pack one box of 28 lbs grapes)

Dried moss has been tried in place of the cork but is is not likely to come into use.

(*c*) It would not be advisable for growers in South Africa to get their barrels from here. All barrels ought to be made on the spot. As to these some details will be found on pages 10 and 11 Consular Reports Malaga district, Annual Series No. *3644* for 1905. Other particulars with regard to the Grape Trade are to be found on pages 15 and 16 Annual Series No. *3937* and on pages Nos. 11, 12 and 13 Annual Series No *4012*.

Month	Days per Month on which rain fell.				Quantity in one-eighth of an inch. (*a*)			
	1905.	1906.	1907.	Average 3 years	1905.	1906 (*b*).	1907.	Average
January	3	2	2	2·33	5·20	1·05	3 73	3 33
February	1	1	2	1·33	0·43	1·25	0·02	0·87
March ..		4		1·33	...	9·79		3 26
April	3	6	3	4 0	5·90	8 62	3 98	6 17
May	1	3	4	2·66	1·33	4 84	2 46	2 88
June	1	1		0·66	1·16	1·18		9·78
July	1	..	.	0 33	1·33	...		0·44
August	..				...		..	..
September	2	7	4	4·33	10·80	50·10	6·50	22·47
October .	2	2	4	2·66	7·53	12 50	4·25	8·09
November	4	2	8	4·66	9·20	6·80	21·05	12·32
December	3	6	4	4·33	7·70	14·86	4·93	9·16
Total	21	34	31	28·66	millimetres 50 60 or 6¼ in.	110·64 or 13·83 in.	47 83 or 6 in.	69·69 8¾ (*c*)

The 1908 returns are not yet published.

(*a*) The rainfall in the returns is expressed to two places of decimals in millimetres, and has therefore had to be reduced to one-eighth of an inch.

(*b*) This is regarded as one of the worst seasons on record for the grape grower.

(*c*) It will thus be seen that allowing for the abnormal rains of 1906 about 6 in. is a fair average rainfall

Note by Trades Commissioner.

On pages 12 and 13 of Consular Report No. 3644 will be found a table shewing cost of labour, etc., and net value of produce of 2½ acres of land planted with Almeria grapes.

From this it will be seen that the Consul estimates that 2½ acres will produce:—

86	Barrels of 1st quality
304	,, ,, 2nd ,,
130	,, ,, 3rd ,,

Total 520 ,, equal to about 11⅛ tons net weight of grapes, and about 100 kilos poor bunches and loose grapes. The cost of production is estimated at £33 14s., equal to about 59s. 1½d. per ton, or about 0·311 of a penny per lb.

The cost of oak barrels, and ground cork, including carriage to farm for 520 barrels is estimated at £58 10s.—about 2s. 3d. per barrel—and the cost of cutting, cleaning and packing is about £17 6s 8d, = 8d. per barrel.

On the credit side it will be seen that the Consul estimates that the grapes will realise the following prices, *after deducting freight, sale charges and commission*:—

1st Quality,	20/- per barrel (of 48 lbs. net)	=	5d. per lb.
2nd ,,	12/- ,, ,,		3⅛d. ,, ,,
3rd ,,	7/- ,, ,,		1¾d. ,, ,,

and a total net profit of £188 7s 4d. or 7s 3d. per barrel, or 1¾d. per lb.

This is after deducting all costs, including production—and the Government tax on land which amounts to £10 for the 2½ acres.

A further examination of the Consul's estimate will show that he calculates the net proceeds of 520 barrels 1st, 2nd and 3rd qualities, after deducting freight and sale charges, to amount to £313 18 0

From this must be deducted the cost of barrels, cork dust, cutting, packing, and carriage to port, etc. 81 18 0

£222 0 0

or about 8s. 6½d. per barrel, or 2⅛d. per lb., not deducting cost of production.

I estimate that the cost of box, cork dust, labour of packing, rail and dock dues, ocean freight and sale charges and commission on one box Cape Almeira, shipped in ventilated hold, and containing 27 to 30 lbs. net weight of grapes, to be from 3s. 6d. to 4s., and if it realizes from 3d. to 4d. per lb. (= 7s. to 9s. 4d. per box) this would leave a net profit of from 3s. 6d. to 5s. 4d. per box, or 1½d. to 2¼d. per lb., not including cost of production.

Extract from Consular Report for 1905. No. 3644.

Timber for grape barrels.—For grape barrels 400 tons of beech wood sawn into staves of the dimensions required came from New York. These staves had been sawn from short cuttings.

Until a few years ago all grape barrels were made of oak chiefly from New Orleans, but now both Spanish and Portuguese pine is largely used. It comes in staves to the needed dimensions. These are as follows, viz: length, 49 centims. (or 50 centims.); width, 5¼ to 6 centims. by 11 millims. thick.

Prices of the staves.—The prices of these pine staves and end for each barrel ranged during the year from 0·65 to 0·80 c. of a peseta placed on the mole, while those of the beech wood from New York cost about 1½ pesetas. The high prices for oak staves have led to the use of pine and other suitable woods. A glance at the table giving the export of grapes will show the importance of the grape barrel making industry.

Ground cork for packing.—For the packing of the grapes ground cork forms a costly item and a good substitute at a lower price is ardently desired. The cost of cork for each barrel works out about 0·95 c. of a peseta. A renewed trial of moss as a substitute has been made, but whether it will be acceptable to the trade has still to be determined. Perhaps the papermaker may some day be able to provide substitutes both for the staves and the cork.

Profits.—Considering the importance of the grape farming industry it may be of interest to many to have an idea of the profit to be derived from the cultivation of the export grape for British, American and other markets, when such cultivation receives close and assiduous attention coupled with a thorough knowledge thereof in all its varied details. One who combines the foregoing qualifications has given the particulars which are noted below. As a basis for these he has taken a hectare of land, equal to about 2½ acres, already planted with the vines at the full producing stage. It contains 300, set in rows, and at a distance from each other of from 19 to 20 feet. For this field about 200 posts of pine or other suitable timber (old locomotive tubes are also used) are required for fixing the network of galvanised iron wire on which the branches are trained and by which they and the fruit are supported. These poles are about 7 feet in length and the trunk of the vine which is kept clean and free from branches is allowed to grow to a height of from 5 to 6½ feet.

The cost of labour, etc., and the value of the produce of the 2½ acres may be summarised as follows, viz:—

Table showing Cost of Labour, etc., and Net Value of Produce of 2½ Acres.

	£	s.	d.	Cost of labour, barrels, etc. £	s.	d.
Wages for ploughing, digging, pruning, sulphating, sulphuring, etc. ...				17	4	4
Water for three irrigations ...				3	3	4
Sulphate of copper ...				3	0	0
Sulphate of lime ...				4	6	8
Farm manure, including carriage ...				5	14	8
Value of pollen from the coloured grape for the white ...				0	5	0
Total ...				33	14	0
520 oak barrels with ground cork, including carriage to farm ...	58	10	0			
Cutting, cleaning, packing, etc. ...	17	6	8			
Carriage to port and shipment of the barrels ...	6	1	4			
Government tax on land. secy. ...	10	0	0			
			—	91	18	0
Grand Total ...				125	12	0

	Net value of produce £	s.	d.
Net proceeds of 86 barrels of grapes first quality (sold in New York from 6 to 8 dols. each), after deducting freight, sale, charges, and commission ...	86	0	0
Net proceeds of 304 barrels of grapes second quality (sold in United Kingdom), after deducting freight, sale, charges and commission ...	182	8	0
Net proceeds of 130 barrels of grapes third quality (sold in United Kingdom) after deducting freight, sale, charges and commission ...	45	10	0
Net proceeds of 100 kilos of poor bunches and loose grapes sold locally ...	2	5	4
Total net produce ...	316	3	4
Deduct charges ...	125	12	0
Net returns ...	190	11	4

NOTE.—Exchange has been taken at 30 pesetas per £.

Month.	Days per Month on which rain fell.	Quantity.
	Number.	Millims.
January ...	3	15·60
February ...	1	1·30
April ...	3	17·70
May ...	1	4·00
June ...	1	3·50
July ...	1	4·00
September ...	2	32·40
October ...	2	22·60
November ...	4	27·60
December ...	3	23·10
Total ...	21	151·80

Extract from Consular Report, 1906. No. 3937.

Grapes.—By grape growers the year 1906 will be long remembered as one of the worst they have experienced. It would have been better for the majority of producers if the 213,000 barrels of increased shipments over those of last year had been converted into a decrease. If the general body of shippers had taken the matter in hand, and adopted some means to prevent the shipment of fruit which could not possibly reach the markets in anything like a sound condition, much of the loss brought about would undoubtedly have been averted. Growers and dealers had advances, and, according to contracts, were bound to ship a certain number of barrels with, in many instances, too little regard for quality and weight. A glance at the fruit brokers' catalogues show the ruinous prices that were obtained, due almost entirely to the reckless shipments which were made.

Rain and grapes.—The beneficent rains of September and October, which have done so much good for agriculture generally, brought disaster upon many of the grape growers. It was generally held that had these two months been comparatively dry, as in previous years, the total shipments of grapes would have reached 2,000,000 barrels. Large quantities of grapes were left on the vines, and could have been bought at 50c. (of a peseta) per arroba.*

Of the total number of barrels shipped, the United Kingdom took over 945,000, or considerably more than one-half of the total quantity, while well on to one-half thereof was conveyed to the various markets by British steamers. From the corresponding table (Annex D. [2]) it will be observed that these have resumed the lead in carrying the fruit from America to New York and Boston. In last year's report note was made of the first call for fruit by the steamship "Cretic" of the White Star Line, and this same steamer, on one of the two trips she made during this season, loaded over 43,000 barrels within the 24 hours. The steamship "Carpathia" of the Cunard Line also loaded within a like period over 42,000 barrels, whilst other vessels of both lines, as well as those of the Anchor Line, so favourably known in the port, were, on the whole, well patronised by shippers, several vessels having to shut out cargo for want of space.

TABLE OF RAINFALL.

Month.	Days per Month on which rain fell.	Quantity.
	Number.	Millems.
January	2	3·15
February	1	3·75
March	4	29·36
April	6	25·85
May	3	14·52
June	1	3·50
September	7	150·30
October	2	37·50
November	2	20·40
December	6	44·60
Total	34	332·93

Extract from Consular Report, 1907. No. 4012.

Grapes.—In no previous year have such large shipments of grapes been made from this port, the total quantity having reached the high figure of 2,446,638 barrels and 20,421 half barrels. To the United Kingdom no fewer than 1,266,793 of the former and 6,093 of the latter were shipped, showing increases over the previous year of 321,922 and 3,998 respectively. Of british steamers engaged in this trade there were 21 fewer this year than last for the United Kingdom and German ports and 4 more for the United States. The 80 British steamers which did take part in the carrying of the fruit loaded 169,544 more barrels than the 97 steamers of the previous year. The smaller number of these is, so far, if not entirely, accounted for by the refusal of some of the owners to send their steamers as in former years rather than agree to certain

*1 arroba = 25 lbs. avoir (about).

conditions established by the Fruit Association. Shippers suffered from the action of the Association, as by October 7 stocks chiefly on the pier had accumulated to the extent of about 300,000 barrels. The association rule to load all steamers by turn must have been very objectionable to many owners and to some of the agents, and steamers which in the usual course would have been available for carrying the fruit were by this time drafted by their owners into other employment. As it however turned out, simply on account of excess of barrels over any previous year, the working of the rule referred to did not bring about the same detention of boats as it would have done in ordinary seasons.

By the date above mentioned the shortage of steamers, in the face of such accumulations lying on the pier unprotected, and with rain threatening, alarmed the Fruit Association, and its rule limiting shipments to 10,000 barrels to United Kingdom ports and 25,000 barrels to United States ports was finally set aside and steamers were then allowed to load to their full capacity. The rain which had been threatening fell on the 8th and again on the 12th, and in some parts of the pier barrels were standing in water up to the bilge. Barrels continued to pour in from the country, and the scramble was to get them all loaded, wet and dry together. It was a rush to court disaster in the British and American markets. Years of experience had made their society fix the limits above mentioned for each steamer. Other rules had kept steamers away, not this one. A good idea of what took place may be gathered from the fact that from October 5 to October 19 750,158 barrels were shipped—264,628 barrels to United Kingdom ports, 436,375 barrels to America (chiefly to New York) and 59,155 barrels to Germany and ports in the Baltic. One steamer sailed on October 10 with 51,000 barrels and another on the 11th with 54,000 barrels, both for New York, while one loaded for Liverpool on the 16th 36,651 barrels. a very long way beyond the 10,000 limit. With the dumping of such quantities into the few markets, the slump in prices naturally followed. From 2 dol. 50 c. to 5 dol. per barrel in New York they fell to 75 c. to 3 dol. and at the end of the season little or no recovery took place.

The season has proved a disastrous one for many of the grape growers, and merchants who gave advances to growers and dealers must have large sums outsanding.

Another attempt is being made to put this large and staple business on a more stable footing, meetings for the purpose have been held and a variety of proposals put forward, but the probability is that nothing practical will result.

In the conduct of the business the experiences of former years were as usual thrown away. From growers and others specially interested three chief points deserve special attention. There are: 1st, classification; 2nd, weight of grapes in barrel and size of barrel; 3rd, advances. As to classification, it is now quite generally admitted that it is essential, and that at least one-fourth of the grapes shipped ought never to be packed in barrels for export on account of their inferior quality. The elimination of such would give the good and superior qualities a better change in the markets, and exporters would save considerably in the matter of barrels, packing, freight and other charges.

2nd. Barrels ought to be kept up to their standard size to contain from 50 to 51 lbs. of grapes. Too many only pack from 38 lbs. (in some cases perhaps less) to 48 lbs. in each barrel, whether it would contain or not the 50 lbs. Adherence to this uniformity would mean a great saving in barrels, freights and other charges.

3rd. With regard to the matter of advances it may be stated that whilst so many of both growers and dealers continue to obtain advances from merchants for a fixed number of barrels without regard to quality

and weight, and shipped without inspection, the evils of bad classification and underweight will remain. The system of advance requires considerable mending, if not ending altogether.

Were these reforms carried out the result therefrom would soon produce their good effects in the pockets of the grape growers.

Rainfall.—From the annexed table it will be seen that the people of this district did not complain of want of rain for their crops without good reason. It can be well imagined what a rainfall of little more than 5½ inches during a whole year means to a district like this with a brilliant sun for 330 days out of 365.

TABLE OF RAINFALL

Month.	Days per Month on which rain fell	Quantity.
	Number.	Millems.
January .	2	11·20
February .	2	2·75
April .	3	11·93
May .	4	7·40
September	4	19·50
October .	4	12·75
November	8	63·15
December .	4	14·80
Total		143·48

FRUIT EXPORT.

Return of Fruit Shipped from Cape Colony during August, 1909

Port of Shipment.	Destination.	No. of Packages.	Description of Fruit.	Quantities.	Value. £	s.	d.
Cape Town ...	England	515	Naartjes ...	47,326	134	2	6
" ...	"	1,784	Oranges ...	258,916	792	7	0
" ...	St. Helena . .	10	" .	1,329	3	0	0
" ...	Walfish Bay ...	1	"	48	0	4	0
" ...	German South West Africa	4	Pears ...	460	1	12	0
" ...	"	1	Loquats ...	450	0	10	0
" ...	"	1	Guavas ...	100	0	5	0
" ...	"	21	Lemons ...	2,480	6	13	6
" ...	"	36	Bananas ...	23,200	20	1	6
" ...	"	24	Pines ...	1,306	13	5	0
" ...	"	112	Naartjes ..	10,577	24	14	6
" ...	"	199	Apples ...	30,780	90	18	0
" ...	"	498	Oranges ...	38,725	121	2	1
Port Elizabeth	England	834	" ...	34,428	223	0	0
" ...	"	113	Naartjes ...	3,825	54	0	0
East London	"	41	"	2,652	2	2	1

ANIMAL DISEASES—CONTAGIOUS AND INFECTIOUS.

Summary of Outbreaks of Contagious and Infectious Animal Diseases Scheduled under Act No. 27 of 1893.

Still under Quarantine on 31st August, 1909.

DISTRICT.	Anthrax.	Epizootic Lymphangitis.	Glanders.	Lungsickness.	Redwater.	Scabies (Equines.)	Sponsziekte.	Tuberculosis.	Totals.
Albert	...	...	...	...	...	...	1	...	1
Alexandria	1	.	...	...	...	...	1	..	2
Barkly East	...	...	...	2	...	...	...	...	2
Barkly West	...	...	...	1	...	...	..	.	1
Bredasdorp	..	...	1	...	...	...	...	...	1
Calvinia	...	...	1	...	...	...	...	..	1
Cape	...	...	...	...	...	...	...	3	3
East London	...	...	...	2	..	...	4	...	6
Hay	...	...	...	2	..	...	...	...	2
Herschel	...	...	...	...	.	...	1	...	1
Humansdorp	...	2	...	...	...	2	...	...	4
Kimberley	...	...	1	...	...	...	...	...	1
King William's Town	...	...	...	7	1	...	2	...	10
Komgha	..	..	...	...	...	...	4	...	4
Kuruman	...	...	...	...	...	...	1	...	1
Mafeking	...	...	...	...	...	...	1	...	1
Mossel Bay	...	...	3	...	...	...	...	...	3
Paarl	...	...	...	...	...	...	1	...	1
Stellenbosch	...	...	...	...	...	...	...	2	2
Stockenstrom	...	...	...	...	...	..	1	...	1
Stutterheim	...	...	...	2	...	...	...	...	2
Vryburg	...	...	...	1	...	...	...	...	1
Wodehouse	...	...	...	1	...	...	...	...	1
Tembuland.									
Umtata	...	...	...	7	...	...	...	...	7
Engcobo	...	...	...	20	...	...	...	...	20
St. Mark's	1	...	...	7	8	...	2	...	18
Mqanduli	...	...	...	4	...	...	7	...	11
Elliotdale	...	...	...	7	...	...	1	...	8
Transkei.									
Butterworth	...	...	...	4	...	...	1	...	5
Kentani	3	...	...	4	...	...	8	...	15
Nqamakwe	...	...	...	5	...	...	...	...	5
Tsomo	...	...	...	2	3	...	...	...	5
Idutywa	...	...	...	10	...	...	1	...	11
Willowvale	...	...	...	8	...	...	7	...	15
Port St. John's	...	...	...	2	...	...	...	...	2
Pondoland.									
Libode	...	...	...	5	...	...	...	...	5
Ngqeleni	...	...	...	3	...	...	...	...	3
Lusikisiki	...	...	...	3	...	...	...	...	3
Flagstaff	...	...	...	1	...	...	...	...	1
Tabankulu	...	...	...	13	...	...	...	...	13
East Griqualand.									
Mount Ayliff	...	...	...	1	...	...	...	...	1
Umzimkulu	...	...	...	...	...	...	3	...	3
Qumbu	...	...	...	6	...	...	...	...	6
Tsolo	...	...	...	20	...	...	...	...	20
Mount Frere	...	...	...	1	...	...	...	...	1
Maclear	...	...	...	2	.	...	...	...	2
Totals	5	2	6	153	12	2	47	5	232

(Sgd.) J. D. BORTHWICK, Chief Veterinary Surgeon.

Office of the Chief Veterinary Surgeon,
Cape Town, 5th October, 1909.

EAST COAST FEVER.

STATEMENT RELATIVE TO THE SAFEGUARDING OF THE COLONY OF THE CAPE OF GOOD HOPE AGAINST THE INTRODUCTION OF EAST COAST FEVER FROM THE ADJOINING COLONIES OF NATAL AND TRANSVAAL.

The following is a resumé of the steps which have been taken by the Government for safeguarding this Colony against the introduction of East Coast Fever from the adjoining Colonies of Natal and Transvaal. The main considerations which have been kept in view are efficient fencing of the Borders, adequate patrolling of the fences and an embargo on the introduction from the infected Colonies of animal produce, grass, hay and other articles which are capable of conveying infection.

The disease has not been reported from the Bechuanaland Protectorate, but in view of the fact that a comparatively small portion of the Protectorate-Transvaal Border is fenced, our Protectorate Border is also guarded.

The following is the distribution of the guards employed and the strength of the respective cordons on the three Borders as well as the Ports of Entry for trade purposes:—

Cape-Bechuanaland Protectorate Border (about 300 miles).—Guarded and patrolled between Ramathlabama and Kuis by 19 C.M.P. and 3 Native Detectives. Camps established at Ramathlabama, Pitsani, Tsedilomolomo, Packenham, Detlaraping and Morokwen.

Cape-Transvaal Border (about 262 miles).—Guarded and patrolled by 34 C.M.P. and 1 Detective. Camps are established at Christiana Gate, Thornhill, Kopje Enkel, Home Rule, Pudimoe, Malalaring, Mosymiyani, Broeders Puts, Welverdiend, Rosaquali, Kraaipan, Maritzani Eye, Rietfontein, Rooigrond, Malmani Road and Ramathlabama.

Cape-Natal Border (about 330 miles).—Guarded and patrolled by 109 C.M.R. and 220 Natives. Three special Native Detectives are also employed in each of the Districts of Umzimkulu and Bizana. Camps are established at Bonnyvale, Stanford's Drift, Brighton, Middleton, Riverside, Railway Camp, Arnold's Drift, Waterfall, Umfulamuhla, Union Bridge, Stranger's Rest, Middleford, Gloucester, Iron Latch, Gugweni Gate, Harding Gate, Staffords Gate, Ingeli Gate, Amanzimyama, Boshof's Drift, Owen's Camp, Mjika Camp, Webster's Drift, Davies' Camp, Impindweni, Lugie, Middledrift, Gunther's Camp, Clark's Camp, Leecon Camp and Umtamvuna Mouth.

At the end of 1907 the strength of the three cordons was as follows:—

Bechuanaland Protectorate: Nil.

Transvaal: 25 Non-commissioned Officers and Privates of the Cape Mounted Police, 1 Native Private and 1 Detective.

Natal: 95 Cape Mounted Riflemen and 32 Native Guards.

A recent inspection of the Cape Colony-Protectorate Border near Kuis (the most westerly point guarded by this Government), made by the local sub-inspector of the C.M.P., indicated the advisability of stationing men in the vicinity of Kuis and Madebing, and mounting them on camels, as, detailed to inspect the whole of that portion of the fence (170 miles). In owing to the long distances to be traversed and the scarcity of water, supervision on horseback was out of the question. Three camels have been purchased for this purpose. Patrolling of this border has so far had a moral value only, for the reason mentioned. Fencing of this border is not

considered necessary at the present time, although the fencing of the portion from Ramathlabama to Pitsani may require further consideration in the near future as illicit introductions generally occur along this section, which has a length of about 45 miles.

Border Fences.—The frequency with which repairs of the Transvaal Border fence were needed suggested a thorough inspection of this fence. As a result it is found necessary to overhaul the whole line of fence, which consists in part of four and five wires only. The strengthening of the fence is now nearing completion When these repairs are completed the fence will be serviceable and durable and will consist of six wires throughout, except on the farm "Home Rule" where the standards, being driven into hard, rocky ground, could not be raised so as to carry an additional wire to bring the fence up to the desired height of 4 feet 6 inches. No advantage would have been gained by making this particular section of the fence a six strand one, as it would have necessitated at least two of the wires being placed within an inch or two of each other, and even then would not have reached the desired height or in any way added to the efficacy of this section for keeping cattle out.

In those sections of the fence carrying seven wires, the extra strand has been inserted by the owner of the farm which the fence traversed in order to render it proof against small stock.

All additional and renewed wires are barbed and all unsound poles have been replaced with iron standards.

On the Natal Border the fencing of the section Boshoff's Drift to the sea (Pondoland Border) was completed at the end of September, 1908. Owing to heavy rains and washaways, the failure on the part of one of the successful tenderers to reach expectations, and the length of the boundary turning out to be nearly double the distance anticipated, in view of the course taken by the Umtamvuna River, this fence was finished about three months later than was intended. The fence erected for Rinderpest purposes, having been in existence from the Drakensberg to Boshoff's Drift and since repaired, it was only necessary, in order to complete the fencing of the whole of the border, to erect the section from Boshoff's Drift to the sea. In the beginning of 1908 considerable pressure was brought to bear in favour of a clear zone along the entire border, and a belt of 800 yards was established, from which all cattle were excluded except cattle to be milked or yoked and those used for the cultivation or removal of produce and transport of goods from the Ports of Entry in that section of the zone extending from the Basutoland border to Ingeli. This was, however, found to be impracticable and also likely to alienate the border farmers in so far as the section from the Drakensberg to the confluence of the Umzimkulu and Ibisi Rivers (about one-half of the border) was concerned; and to that extent the belt was accordingly withdrawn. The same reasons applied also to the portion of the border north of Alfred County; but as this section had not the advantage of a river frontage, it was deemed advisable to erect a double fence about 50 yards from the then existing fence along this extent (about 50 miles), and upon completion of the fence, in August, the 800 yards belt along this section also was withdrawn. Meanwhile, an inspection by the Resident Magistrate of Umzimkulu of portions of the fence along the Umzimkulu River indicated that the fence from the Drakensberg to the junction of the Umzimkulu and Ibisi Rivers needed overhauling. A competent officer of the Public Works Department was some parts silt and rubbish had washed up against the fence to a height of 2 feet, thus lowering it to only 2½ feet. Extensive repairs were also recommended to place that section in the condition required to afford suitable protection against the introduction of cattle from Natal. Immediate steps were, therefore, taken to effect these repairs, at a cost of about £2,700, the

fence being at the same time heightened to 5 feet 6 inches in those parts where the configuration of the ground rendered a height of 4 feet 6 inches inadequate.

It had long been felt that for the proper protection of Pondoland it would be preferable to come to an arrangement with the Natal Government for the fencing of the Umzimkulu River from the point where it enters Natal territory to the sea, owing to the precipitous banks of the river and its affording a securer barrier than the Umtamvuna River, which is shallow and easily crossed. Alfred County, however, lies between these rivers, and if the Natal Government had agreed to the lower Umzimkulu being regarded, for East Coast Fever purposes, as the Cape Colonial-Natal boundary, restrictions as regards the movement of cattle between Alfred County and this Colony would have had to be relaxed.

A meeting was accordingly arranged of the Chief Veterinary Surgeon of this Colony and the Divisional Engineer of the Public Works Department at Kokstad with the officers of the Natal Government for inspecting the lower Umzimkulu, as a result of which it was found that from about November to the end of March it was impossible for cattle to cross the river, while during the remaining months of the year, when the river was not in flood, the cattle could not cross with safety except at two places. The expense of fencing the lower Umzimkulu was, therefore, not justified, and it was decided, for the present at any rate, simply to guard those drifts at which it would be possible for cattle to be brought into Alfred County from the remainder of Natal. One European and 30 Native Guards are being maintained *at the expense of the Cape Government.* At the same time the guards on the Pondoland border are being maintained at their full strength.

Restrictions.—The following are those at present in force:—

(*a*) From Natal no cattle, animal produce, grass, hay, reeds, rushes, herbs, plants (other than cultivated ones) or other vegetable matter can be introduced. Through Stanford's Drift and Union Bridge only vehicles and goods not prohibited which have been hauled all the way to the Border by equines from Donnybrook or Ixopo, as the case may be, are admitted. Through Riverside all live-stock other than cattle, sheep and goats, and all articles and things whereof the introduction is not specially prohibited and which are not conveyed in cattle trucks are admitted by rail only. This Port is also open for equine transport used solely for the conveyance of passengers and their personal effects. Ingeli and Harding Gates are open only for human beings and their personal effects and mail bags. Mail bags can only be brought through Middledrift, under the supervision of the Border Guard.

(*b*) From the Transvaal the introduction of cattle, grass, hay, reeds, rushes, cattle manure, and *green* hides, skins and horns is prohibited. Vehicles drawn by equines can cross the border at any gate, but those drawn to the border by cattle can only enter at Rooigrond and Mosymiyani after being outspanned on the Transvaal side, whence they are drawn across the border by mules. *Dry* hides, skins and horns have to be properly cured and dressed, and to be accompanied by a certificate by the Principal Veterinary Surgeon of the Transvaal to this effect. Wool and mohair must be properly baled and come direct to a railway station between Mafeking and Fourteen Streams for consignment to a port without being opened *en route*.

(*c*) From the Bechuanaland Protectorate the introduction of all cattle other than slaughter stock is prohibited, and slaughter stock have

to be dipped under supervision at Ramathlabama before they enter.

(*d*) From Rhodesia the introduction of cattle, grass, hay, reeds, rushes, and *green* hides, skins and horns is prohibited. *Dry* hides, skins and horns can enter only under the same conditions as in the case of the Transvaal.

(*e*) From the coast north of Durban the introduction of cattle, sheep, goats, buffaloes and antelopes is prohibited.

The grazing or depasturing of any horned cattle on the land lying between the Ingwangwane, Indowana, Umzimkulu and Umtamvuna Rivers and the Border Fences is prohibited under penalty of immediate destruction without compensation, while the removal from the same area of grass, hay, rushes, reeds, herbs, plants and other vegetable matter liable to carry ticks is also prohibited.

The importation into or removal from place to place within the Transkeian Territories, with intent to spread East Coast Fever, of any animal or portion of the carcase of any animal or any articles or things which, either by contact with any affected animal or through any other means, are liable or capable or have been rendered capable of transmitting the disease is prohibited under a penalty of £500 or seven years' imprisonment, or both such fine and imprisonment.

An Advisory Board, composed of Europeans and Natives, to assist the local Magistrate, has been formed at Umzimkulu. This Board has been of considerable assistance to the Department, and has been the means of establishing a system of co-operation between the Government and the local people.

The following is an extract from a report furnished by the Chief Magistrate, Umtata, in September, 1908:—

"At meetings held by me with the Natives in Eastern Pondoland, at Bizana, Flagstaff, and Lusikisiki, I fully explained the nature of East Coast Fever and the means by which the disease was spread, and how its introduction could be prevented. I found a most excellent spirit prevailing; the people expressed their hearty thanks to the Government for the steps already taken to prevent the disease from entering the Territories from Natal. . . . The danger of infection being introduced arises from several causes. First, there is the very natural desire on the part of Natives in Alfred County, Natal, who are Pondos or allied to that tribe, to remove their cattle as the disease approaches, and place them for greater safety with relatives and friends in Pondoland, and of Bacas and Hlangwenis in Natal endeavouring to remove cattle to their fellow tribesmen in the District of Umzimkulu. Against this I most strongly cautioned the Natives at all the meetings held by me. The second cause arises from the fact that cattle can be purchased very cheaply in Natal, more especially in the neighbourhood of infected areas, and there is always a danger of unscrupulous persons, for motives of gain, endeavouring to evade the regulations, and introduce cattle which in the Umzimkulu and Eastern Pondoland districts are in demand at fair prices for the purpose of cattle contracts in procuring labourers for the mines. This can only be prevented by the unfailing diligence and alertness of the Border guards and co-operation of the farmers and Natives. I am pleased to state that reports from all sources show that the whole of the border is being most carefully guarded, and men are alive to the very responsible nature

of their duty. The third source of danger arises from the use of oxen for transport purposes, but under existing conditions I do not advise any alterations."

A deputation of Pondos accompanied by Veterinary Surgeon Spreull recently visited the scene of the latest outbreak in Natal, at Elim Mission Station, where they were fully impressed with the serious nature of the disease.

Eleven men have been specially appointed for the purpose of repairing any breaks which may occur in the fence along the Natal Border. These men move constantly up and down the fence, each taking a defined section, and at the same time do the duty of guards, while 84 additional Natives have been specially engaged to guard the drifts across the Umzimkulu and Umtavuna Rivers to prevent cattle being smuggled across at night. Twelve extra guards have also been engaged on the land boundary between the Ingeli and the junction of the Ibisi and Umzimkulu Rivers.

Depots have also been established at Riverside, Umzimkulu, Bizana and Port St. John's, where an emergency stock of fencing materials has been stored to enable the Government to cope without delay with any outbreak, in the event of the disease crossing the Border.

A Veterinary Surgeon was specially detailed for examining outbreaks of disease on the border, both in this Colony and in Natal territory, for the purpose of ascertaining the nature of the disease, and arrangements have been made for conducting, with the consent of the Natal Government, experiments with the use of Trypan Blue in the infected location in the Lower Umzimkulu part of Alfred County.

Special legislation (Act No. 17 of 1908) has been passed giving full powers for dealing with any outbreak of East Coast Fever, and the Department is, therefore, in the position to take prompt measures should it unfortunately be necessary to do so.

The Government has determined to adopt a policy of clearing the Districts which border on Natal as far as possible of ticks, and, with this object in view, is adopting the following measures, viz.:—

1. Dividing fences between the Lower Locations in the Umzimkulu District and the adjoining properties are being erected under the Fencing Acts as rapidly as possible.
2. A new fence is being erected from Fort Donald through Pondoland to the sea, in the event of the necessity hereafter arising for providing a further line of defence.
3. Arrangements are being made for the erection of twenty cattle dipping tanks on approved sites and 10 miles or less apart within which belt periodical dipping will be made compulsory as soon as the tanks are completed.
4. Stock inspection will be arranged for at Government expense.
5. Supervision of dipping will be provided and dip supplied (*a*) at cost of owners in European areas; (*b*) at cost of the Council in District Council areas, and (*c*) out of the proceeds of a special tax of 2s. 6d. which will be re-imposed in non-Council Native areas.
6. The offer of monetary grants on the £ for £ principle in aid of the construction of cattle dipping tanks has been withdrawn, and is being superseded by a system of advancing loans from public funds subject to repayment with interest in annual instalments.

As a further precautionary measure, the District of Bizana has already been proclaimed a "suspected" district, from or into which the removal of any horned cattle is absolutely prohibited. Transport wagons and goods from adjoining districts of this Colony are only admitted through Nqabeni

Drift, where they are hauled across by a steel cable after the oxen drawing them have been outspanned on the Flagstaff side of the boundary. Sixty Native Guards under the charge of three C.M.R. have been engaged to guard all drifts where cattle may cross or be illicitly introduced, and to patrol the boundary, whilst the Headmen of the Border Locations are also being granted a small monthly allowance in consideration of their rendering similar assistance. Any cattle which may be introduced into the Bizana District from adjoining districts will be impounded by the Headman of the Location in which they are found and isolated as completely as circumstances permit pending an enquiry by the Resident Magistrate and instructions as to their disposal. It may be added that only human beings on foot with their personal effects are permitted to cross the Border from Bizana into Natal, and then only through Middledrift.

Cattle Dipping.

The Cattle Cleansing Act, No. 31 of 1908, may be taken as the first step in the direction of legislation for preventing the spread of ticks by the removal of cattle. The main provisions of the Act are that tick-infested cattle may not be on any main, divisional or municipal road, nor on any public outspan or commonage, unless they have been cleansed within 14 days, and they must be under the control of a competent person. This does not, however, apply to cattle of persons within the boundaries of their properties. Cattle on such a road or place may be inspected by a Field-Cornet, Justice of the Peace, Sheep Inspector or Police Officer, any of whom may demand to see the certificate required by the Act. These officers are also enjoined, if the certificate be not forthcoming, to cause the cattle to be cleaned at the cost of the owner.

By Proclamation No. 521 of 1908, the term "cleanse" was defined and the form of certificate required prescribed.

The Act has been proclaimed in force in the Divisions of East London, Bathurst, King William's Town, Komgha, Albany, Port Elizabeth, Fort Beaufort and Alexandria, and is being extended to the Victoria East and Peddie Divisions. It leaves Divisional Councils to decide whether it shall be enforced in their division or not.

Fair progress has been made in regard to the construction of cattle dipping tanks, which are distributed as follows:—

List of Public and Private Dipping Tanks.

District.	*Public Tanks.*	*Private Tanks.*
Albany ...	Grahamstown ...	Mount View, Manly Flats, Jericho, Thorneycroft, Glen Boyd, Ballinafad, Southey's Hoek, Ashtondale, Ward Vale, Clay Pits, Frazer's Camp, Bucklands, Crosslands, Hebron, Sweet Kloof, Pleasant Prospect, Mount Pleasant, Woodlands, Middleton, Ellende, Schmit Kop, Woodberry, Retreat.
Alexandria ...	Alexandria Commonage, Paterson Commonage, Graaff Water, Doornkloof.	Hopefield, Leeuwenbosch, Bushy Park, Hilary, Bluegum Villa, Sea View, De Grip, Thornhill.
Adelaide ...	...	Saxfold Park, Elandshoek.
Bathurst ...	Round Hill Outspan, Brak River Outspan, Bathurst.	Greenfountain, Thornhill, Tharfield, Lombard's Post, Mt. Wellington, Rokeby Park, Summerhill, Theopolis, Coombs.
Bedford ...	Klipplaat ...	Bellevue, Cullendale.

District.	*Public Tanks.*	*Private Tanks.*
Butterworth	Butterworth Commonage.	
East London	East Bank Location ..	Dreyer's Hoek, Prospect, Hillside, Elliottdale, Shelford, Ferndale, Amalinda, Farms 10 and 89 in Ward 5, Farms 154 and 113 in Ward 6, Gonubie Park, Lilyfontein.
Engcobo ..	Engcobo Commonage ...	Nil.
Fort Beaufort	Fort Beaufort, Yellowwoods Outspan.	Baddaford, Olive Cliff, Septon Manor, Rocklands, Rietfontein, Clifton, Botha's Post.
George ...	George Town, Diepkloof, Woodville.	Nil.
King William's Town	King William's Town, Berlin Commonage, Keiskama Hoek, Wolcomewood.	Gray's Drift, Gobongo Park, Gonubie, Mowbray Park, Sparkington, Izeli.
Knysna	Knysna, Eastbrook ..	Nil.
Komgha	Komgha Commonage ..	Lincoln, Kei Bridge, Stainland, Annexation, Mooi Plaats, Farm 267, Kwelera; Farm 292, Farm 287, Waterfall, Keikop, Ewanrigg, Lower Kuku, Lot 46, Westbury, Thorn Park, Denston.
Mount Currie ...	Hermon .	Fairview.
Mqanduli	Mbozisa	Nil.
Nqamakwe	Blythswood .. .	Nil.
Port Elizabeth ...	Port Elizabeth (in course of construction).	Bushy Park, Little Chelsea.
Peddie ..		Pera, Gola Poort, Dunstan, Wooldridge.
Stutterheim ...	Bolo Police Reserve	Cloverdale, Quetta, Wetherrun, Waterford Estate, Woodridge.
Uitenhage ...	Glen Connor .	Cuyler Manor, Perseverance, Prentice Kraal, Maitland River, Coega's Kop, Tankatara, Aloes.
Umtata	Umtata	Nil.
Umzimkulu .	Umzimkulu, Lourdes, Riverside.	Sneezewood.
Victoria East ..	Alice, Calderwood .	Alandale, Witney, Nottingham.

In addition to the foregoing, cattle dipping tanks, which are available for use by the public, have been constructed by the District Councils in the following Districts of the Transkeian Territories, viz.:—Elliotdale (1), Engcobo (1), Idutywa (1), Kentani (3), Mqanduli (2), Qumbu (1), Tsolo (1), Umtata (3), Umzimkulu (2) and Willowmore (1), while two tanks are being constructed in the Mount Ayliff District.

In Pondoland 16 tanks have been completed, distributed as follows: Bizana, Libode and Ngqeleni, 3 each; Flagstaff, Lusikisiki and Tabankulu, 2 each; and Port St. John's, 1.

For dipping in the districts in the Native Territories under the Transkeian General Council funds to the extent of £1,000 were provided by the Council for the financial year 1908—1909, in order to popularise the practice of periodically dipping large stock, while the Natives have already been and continue to be urged by Government officers in the Territories to take advantage of the facilities provided for cleansing their cattle.

In several instances the firm of Messrs. McDougall Bros. has been undertaking the trial dipping and instructing the Council's employés, while in Tembuland and the Transkei results of previous dipping are said to be steadily making favourable impression, and to be the means of spreading the desire for it.

The question of supervising dipping operations in Pondoland, where the difficulties are far greater, is at present under consideration.

EXPERIMENTS WITH OSTRICHES—X.

HOW THE BARS IN OSTRICH FEATHERS ARE PRODUCED.

By Professor J. E. DUERDEN, M.Sc., Ph.D., A.R.C.S., Rhodes University College, Grahamstown

The experiments in connection with the investigations of the bars in ostrich feathers have progressed so far that a definite understanding has been reached as to how the defects are produced; on the other hand the endeavours to work out a remedy for their prevention have made considerable progress, but are not yet concluded. The following account of how the bars are formed will assist in an understanding of some of the difficulties involved in their prevention, and may direct attention towards a solution.

It is suggested, for reasons which will be evident later, that the name *shrinkage bar* should be applied to the ordinary kind of bar with which all ostrich farmers are familiar. It will serve to distinguish it from others known as *poverty bars, constriction bars,* and *vertical bars,* the formation of which will be described on another occasion.

Shrinkage bars are by far the most familiar and the most important of all the structural defects of the ostrich feather. It is rarely, if ever, that the plumage of a bird is altogether free from them, and when present in any number they lead to a serious depreciation in the value of the plumes, since they represent so many faults and weaknesses in the continuity of the flue. They are found on ostriches of all ages, though perhaps more frequently in chicks and young birds; moreover, they occur on the plumes of the wild ostrich as well as on those of the domesticated bird, and similar imperfections are occasionally to be seen on the feathers of all other kinds of birds.

Such a wide distribution as the above indicates that the barring defects are to be associated with something fundamental in the formation of feathers generally, not anything peculiar to the ostrich. It will be shown that their immediate formation, at any rate in the ostrich, is due to the shrinkage of the plastic feather-sheath around the soft and growing parts of the feather; and also that the shrinkage invariably takes place at certain well-defined places, which represent the weaker growth at night, resulting from a diminished physiological vigour. Produced in this way they may reasonably be expected to occur in all birds, since the feathers of all are formed alike.

The appearance of a shrinkage bar is but too familiar to anyone interested in ostriches or ostrich plumes (Fig. 1). It consists of a break or fault in the regular formation of the flue, a narrow interruption extending in an oblique manner across the feather, but not often passing all the way along both sides; the outer side of the shaft also may be notched at the same level. Looked at carefully a single bar is seen to represent a defect at practically the same place on each barb, and the actual defect

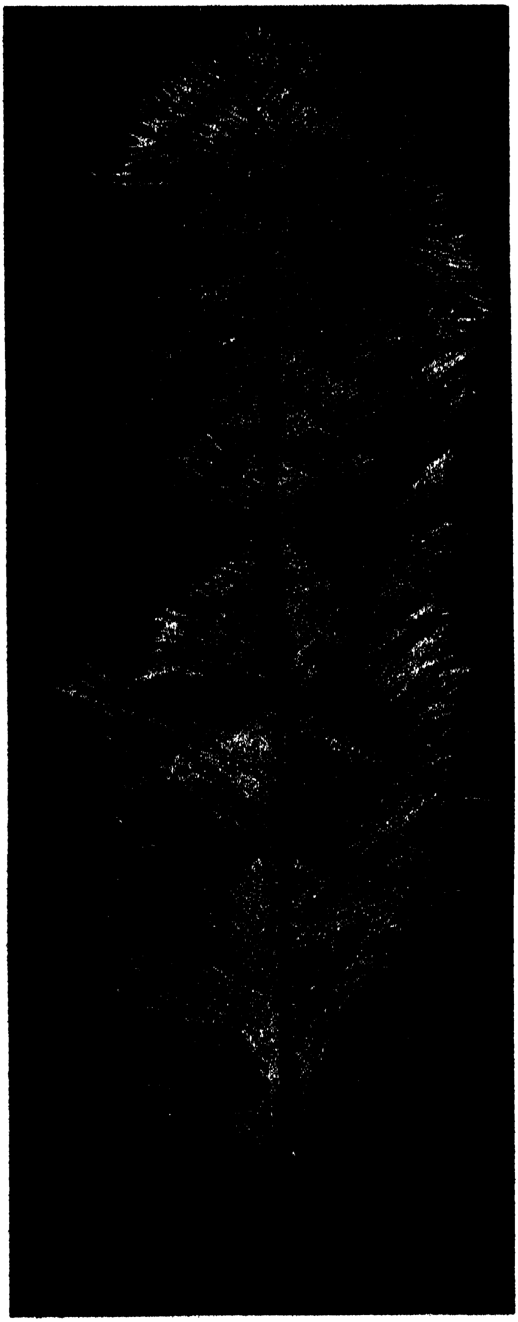


FIG. 1.

Plume showing very conspicuous bars at wide intervals apart, but closer towards the upper end. The flue is broken in places, corresponding with the bars. The shaft is also deeply notched at the bars, and towards the lower part shows the daily rings very clearly, though too faintly to appear in the photograph.

consists of an imperfect or deficient development of the barbules; also any single barb may have one or several defective places in it, depending upon the closeness of the bars to one another.

As shown in the sketch (Fig. 2), the barbules in the region of the defects are shorter and do not project from the barb to the same degree as elsewhere. In strongly marked examples even the barbs are not separated from one another, and the barbules are altogether absent, as in Fig 3.

FIG. 2.

A portion of the shaft of a feather with three barbs attached to one side, each barb showing six barring intervals which correspond with the same number of complete bars on the entire plume. Where each bar occurs the barbules are either altogether absent or only partly developed, and the barb itself may be slightly kinked.

In addition, the barbs themselves are usually slightly bent or kinked, and if the fault extend across the shaft, the latter is deeply indented in an angular manner. *The entire appearance suggests that at the bar the feather has been subjected to a compression or shrinkage while it was still soft and in process of development, the pressure preventing the proper formation of the flue and shaft, and later their proper unfolding as the feather ripened.*

It is also of some importance to note that the vertical height of the individual bar varies but little; and further they are never broad, but always very narrow, rarely exceeding a sixteenth of an inch across. The reason for this will appear later.

FIG. 3.

A portion of the shaft of a feather with four barbs attached to one side. The barbs are bound to one another where the deep bar occurs. On each barb two other barring places are shown beyond that at which they are united.

That the bar is a place of weakness in the flue is seen by the readiness with which breakages take place wherever the bars occur, when if numerous the breakages render the feather almost valueless. (Figs. 1, 4, and 5.)

The number of bars on different plumes varies. Sometimes only a few will be present, and then more especially towards the free end, while at other times they occur at more or less regular intervals along nearly the entire feather. On some plumes they are so arranged as to suggest an alternating regularity, that is, an arrangement at equal distances apart.

This can, however, be departed from in every respect, and often the bars show a most haphazard character in the number and extent of their formation. Sometimes they extend entirely across the plume, involving also the shaft in the middle, while again they may pass only part way across the flue, or may be practically limited to one side; further,

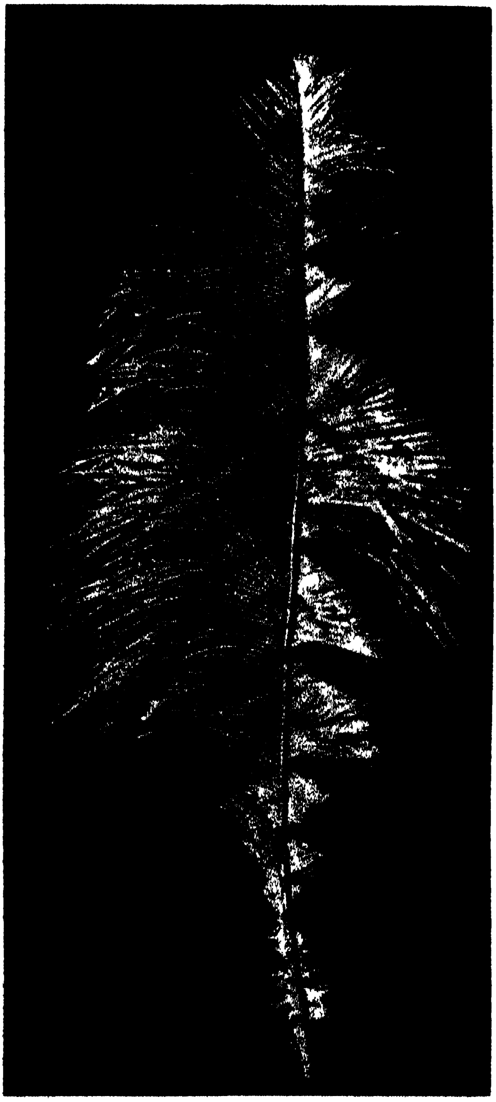
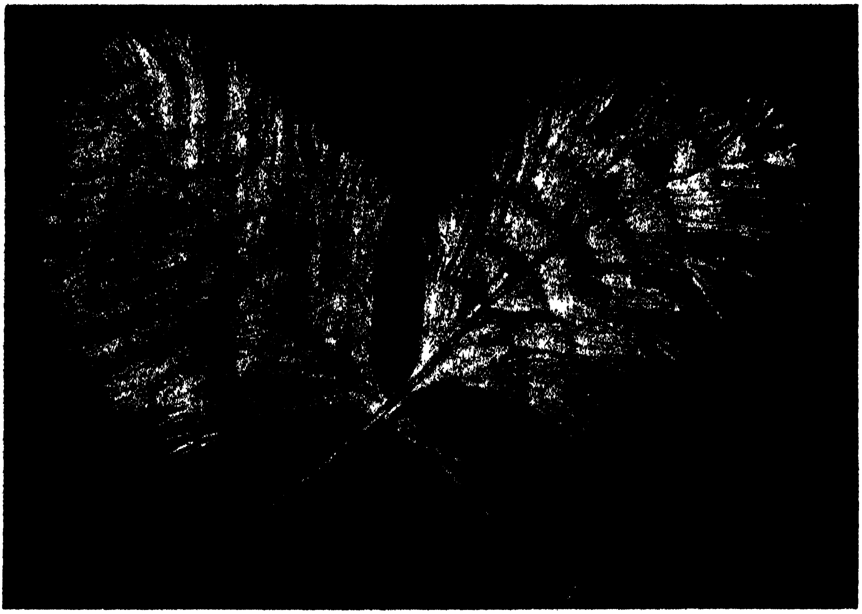


FIG. 1.
A strongly barred plume showing breakages of the flue where the bars occur.

although always narrow, the individual bar may be strongly or faintly indicated, and all stages occur between the extremes.

As regards the separate feathers on an ostrich, these also vary greatly in the degree to which they are affected. Some birds will have almost the entire plumage barred, the wing feathers, tails, and body-feathers, while in others only a few plumes will show the imperfection.

All the feathers seem equally liable to the defects, though they are more conspicuous on the commercial wing and tail feathers than on the small body-feathers. The most remarkable feature, however, and the one most puzzling to account for, is the extent to which variation is shown among the feathers growing under the same conditions, not only of different birds, but even on the same bird. Single wing plumes may be altogether free from the defects, while others, and especially the feathers towards the free end of the wing, will be freely barred. Sometimes the feathers of one wing will be affected, while those of the others are free. It is also found that single feathers growing out of time, that is, not as part of a full crop, are much more likely to be deeply barred than those constituting part of a full clipping. This applies more especially to single feathers



FIGS. 5 AND 6.

Two partly growns-plumes showing very conspicuous bars. In the unexpanded portion are shown the deep notches or wrinklings on the feather-sheath which by constricting the growing feather produce the bars. Such deep bars occur at intervals of four or five days growth, not at each night ring; smaller notches, not seen in the photograph, represent the daily rings.

which are started in advance of the full crop, than to odd feathers appearing after a crop has begun its growth. Lastly it is well recognised that the plumes of some strains of birds have a great tendency to faultiness, while those of others are nearly perfect; and also that at one time the entire clipping from a bird will be barred, while at another the crop will be free from them. It is these many differences in the occurrence of the bars which render a simple solution of the problem peculiarly difficult.

THE IMMEDIATE CAUSE OF THE BARS.

The immediate cause of the bar is not far to seek. If one examines the lower unopened part of a growing feather in which the faults occur, it will be seen that the outer sheath is more or less deeply wrinkled or notched at intervals, and by stripping away the sheath it is found that

the developing feather inside is also indented. The indentations are seen to have in some way interfered with the proper formation of the feather beneath them; and from the appearances it can be understood that as the feather matures and comes to unfold a defect will be formed at the level represented by each wrinkling. This is well shown in Figs. 5 and 6, where the wrinklings on the unopened part of the feather clearly correspond with the barring above. From long observation every farmer knows, even before the plumes unfold, that bars will be present wherever the outer sheath is indented, while if the sheath is smooth all the way the feathers will be faultless. *It can be accepted, then, without any question, that the bars represent places at which the feather, while soft and growing, has been wrinkled or indented in such a manner as to prevent the parts beneath being fully developed.*

Day and Night Growth.

The important point, however, is to account for the wrinklings which produce the bars, and to explain how they are formed. In some of the best examples of barring the defects occur at such regular intervals as to suggest that they correspond with some structural feature in the formation of the feather. And it has recently been shown that such is actually the case. *It is now known that feathers, even under the best of conditions, do not grow in a continuous manner, uninterruptedly from one end to the other, but consist of alternations of day and night growths, and that these alternations represent a daily increase and decrease in the physiological vigour of the bird.** Under ordinary circumstances, however, there is so little distinction between the night and day growth that as the feather ripens and opens out practically no evidence of it is seen, and the plume appears as a continuous formation without any interruptions; but under other circumstances the difference between the night and day growths becomes conspicuous and traces of it are noticed when the plumes expand, while in extreme cases the night growth becomes indicated by the wrinklings which result in the bar.

This new conception of the formation of a feather calls for careful consideration by ostrich farmers, and the evidence for it can be easily observed by themselves. If the wing be uplifted the alternations of growth can be seen on the unopened part of most growing feathers as a succession of narrow and broad rings which represent a difference in the feather density. The rings occur even where no bars are being produced. They are most pronounced in young blacks and drabs, in the portion of the growing feather freshly drawn from the socket and for some distance in the unopened part beyond the socket. This is owing to the fact that in blacks and drabs the dark unopened plume inside contrasts strongly with the translucent feather-sheath, and thus the denser and lighter parts are revealed. The soft growing part of a white wing plume is also often dark in colour, and in these the rings are easily distinguished where at all well formed. The denser broader rings represent the amount of growth added to the feather during the day, and the thinner, narrower rings the night growth, the alternation becoming evident owing to the fact that one part is denser or stronger than the other. The night growth appears as little more than a narrow ring of separation between the successive day growths, and it is manifest that the daily rate of growth can be ascertained by measuring the distance between successive day rings on the unexpanded feather. This is usually about a quarter of an inch in the wing plumes, but less in the others.

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*This conception of day and night growth in feathers was first elaborated by Dr. O. Riddle of the University of Chicago (Biol. Bull., Vol. XIV., May, 1908).

As the various parts of the feather ripen and open out, the difference between the day and night growth largely disappears, even where conspicuous in the early stages of the unopened feather. A plume can be considered as perfectly formed only when this is the case, and ripe well-grown feathers often show no trace of the daily alternation. Most plumes, however, when held in certain positions reveal indistinct interruptions or weaknesses in the flue corresponding with those in the unopened feather, and sometimes the shaft is more or less indented on the outer surface, the rings becoming complete on the quill. These shaft indentations can easily be felt by passing the finger up and down the stem. In the best examples it will be found that the weakenings in the flue and also the indentations in the shaft occur at intervals of about a quarter of an inch, which, as stated above, is the rate of daily growth of the wing feathers. After one has become acquainted with the appearance of the day and night intervals, on both the growing and expanded parts of the feather, traces of them can be recognized on almost every feather, both on the flue and on the stem; they are not sufficiently strong, however, to be represented in photographic reproductions.

How the Day and Night Rings are Produced.

The further question presents itself: how is the alternation of day and night growth produced, and what is its influence on the feather? Without entering into details it may be stated that it has been proved experimentally that in most birds the temperature of the body is lowered at night and along with it the blood-pressure. This signifies that less physiological activity is taking place during the night than during the day, and consequently less feather material is then being formed; the feather continues to grow both day and night, but less vigorously during the night repose. The diminished activity in feather-growth at night particularly affects the barbules and the outside sheath, on account of their cells being furthest from the blood supply in the middle of the feather; the nutritive fluids do not ooze to their cells as freely as they do under the stronger pressure of the day. Hence these parts are the first to suffer in any lowered vitality. Though the shaft and barbs may grow uniformly day and night the barbules and sheath yet suffer from the diminished blood supply at night. From the above it follows that the night growth, if only for a few hours, is normally not as strong as that during the day, and therefore we get the alternation of the narrow and broad rings seen on the unexpanded feather.

Owing to their less density it is clear that the night rings will represent so many places of weakness in the feather, both as regards the sheath and the internal feather-forming material. With a bird in a high nutritive condition, and under ordinary conditions of day and night, the difference in the two growths is, however, barely perceptible; and even where it can be distinguished on the unopened feather it is scarcely noticeable when the plume matures and unfolds. Under other circumstances, particularly those of impaired or deficient nutrition, it has been proved that the difference between the two growths becomes intensified, and then the rings on the unopened feather remain as bands of different density on the expanded flue

Wrinklings Produced at Night Rings.

Having now shown how the night rings are places of weakness in the growing parts of the feather the next step is to establish the connection between them and the wrinklings, the latter being always present when barring is at all conspicuous. If within the soft growing feather the

pressure of the blood be largely diminished, as would happen by having some of the blood withdrawn from the middle, the outside sheath of the feather will naturally tend to shrink or partly collapse, in order to accommodate itself to the diminished turgidity; and the manner in which this shrinkage takes place is the all important matter. *It is found that the feather-sheath always gives way at the weaker night rings, and in such a manner as to produce a narrow wrinkle, and the wrinkling naturally presses upon the soft growing plume below it and thereby interferes with its proper growth.* The blood-pressure within the growing feather has been diminished, and the wrinkling of the feather represents the mechanical effort of the more resistant outer part to adapt itself thereto.

The wrinkling must necessarily occur before the feather has become hard and firm, that is, in the early stage of its growth, while still soft and unformed. Several wrinklings are often seen when a barring feather is drawn green from its socket, the upper ones being more strongly indent-

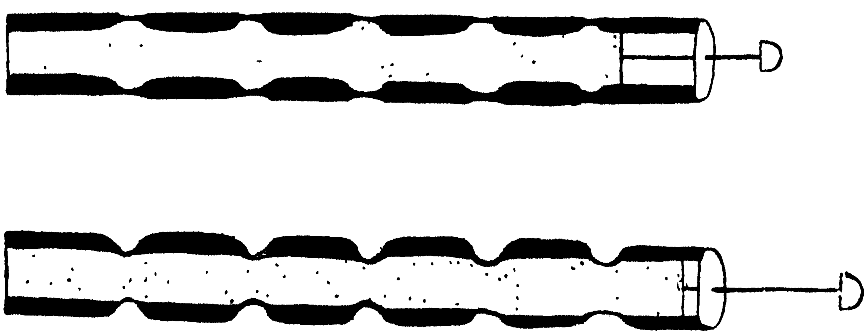

FIG. 7.

Model to illustrate how the feather becomes notched and indented at places corresponding with the weaker night growths when the internal blood pressure is reduced. The wall of the tube is made up of alternating stronger and weaker rings corresponding with the day and night growth. In the upper figure the internal and external pressures are the same, and tube remains smooth; in the lower figure the weaker parts of the tube have sunken in due to the diminished internal pressure produced by drawing out the piston.

ed than the lower. It is thus of some importance to find that the shrinkage bar commences at a very early stage within the socket, in fact as soon as the feather-sheath has become hornified, but while soft and plastic.

The wrinkling process may be illustrated as follows: a rubber tube closed at one end and fitted with a piston at the other is filled with water under ordinary pressure: if then the internal pressure is reduced, by drawing out the piston, the tube will partly collapse at the least resistant place, due to the outside pressure of the atmosphere upon the plastic rubber. The illustration more closely resembles what takes place in the feather if we suppose the rubber tube to be made up of alternate stronger and weaker rings. While under ordinary pressure the surface of the tube will be smooth, as in the upper diagram in fig. 7, but on reducing the internal pressure, by drawing out the piston, the tube will tend to collapse and wrinkle at the thinner, weaker rings, as shown in the lower diagram. And this is what happens in the growing feather, where the stronger and weaker rings correspond with the day and night growth.

We must look upon the growing feather as a long narrow tube, closed above and open to the blood supply below; also the tube is made up of alternate stronger and weaker rings, and is filled internally with the blood fluid under a certain pressure. The upper part of the tube where the

feather is nearly fully formed has become firm and resistant, while the lower growing part is still soft and plastic and capable of shrinking. Under these conditions any temporary lowering of the blood-pressure, as by partial withdrawal of the blood, will have to be met by the shrinkage of the wall of the tube, and this naturally takes place by wrinkling at the weakest places, the night rings within the socket. In the process of growth the lower parts of the tube, along with the wrinklings, passes higher and higher, and at the same time becomes more horny and resistant. Moreover, it would seem that the wrinklings once produced are never straightened out by any subsequent restoration of the pressure; indeed they become intensified as they grow upwards on account of the normal drying-up of the feather as the blood is withdrawn from the middle.

Good examples of the wrinklings on feathers are sometimes produced when a growing feather is drawn from the socket and then allowed to dry. The plucking of the unripe feather results in a loss of blood from the medulla, and the internal pressure being thereby dimished the sheath tends to shrivel upon the parts inside; the shrivelling takes place at the night rings, and the wrinklings assume the form of those produced naturally in barring feathers.

The deepest constrictions are rarely produced at each successive night ring, but, as shown in Figs. 5 and 6, may be about an inch apart, which represents four or five days' growth. Evidently a single collapse suffices to meet the variations of the blood pressure within this period, and there is no necessity for an indentation at each ring. By the time the feather at the wrinkling has grown an inch or so the sheath is becoming firm and resistant and not sufficiently plastic to continue to adapt itself to the pressure variations, and therefore a new collapse is formed lower down where the sheath is weakest.

How the Wrinklings Produce Bars.

With the above before us the production of a bar may be understood as follows. The wrinkling of the feather-sheath and the indentation of the feather substance below always occur while the feather is in unformed condition and within the socket. When this takes place the nutritive fluids in the region of the wrinklings will in some measure be squeezed away, and as a result of this and the compression the parts of the feather will not form properly, the barbs will be thinner and the barbules shorter, and a place of weakness and feather deficiency will result, to be revealed when the plume opens out. The deeper the wrinkle the greater is the compression, the less flue is formed beneath it, and the more conspicuous is the bar; so that all degrees in the production of a bar are represented, often on the same feather. Some are barely noticeable, while others are very evident; moreover any wrinkle rarely passes all round the growing feather, and in this we have the explanation of the fact that the bars do not often extend completely across the plume.

It has been supposed that the mere alternation of the day and night growth would suffice to produce conspicuous bars in birds, but so far as the ostrich is concerned, this is not the case. *It is only when the wrinkling takes place in addition to the weakened night growth that defects of importance appear; hence on the growing feather, even before the plume opens out, it is quite easy to see whether or not bars are forming.* It would be difficult to conceive that the difference between the nutrition of the growing feather during the day and the night could be so great that in one case the barbules would be fully formed while in the other they would be absent, whereas all the appearances can be satisfactorily explained by the production of the indentations from the partial collapse

of the feather-sheath As the wrinklings are rarely produced uniformly they afford a satisfactory explanation of the variations in position and extent of development of the faults as compared with the regularity which would be expected from the day and night differences alone.

It results from the above that *two conditions are necessary for the production of shrinkage bars in ostrich feathers. First, the alternation of day and night growth, due to a slight difference of blood-pressure as the feather is forming, giving rings of different thickness or density; second, greater variations in the blood-pressure within the medulla of the feather, leading to a partial collapse or wrinkling of the feather-sheath at the weaker night rings, whereby the feather is prevented from attaining its full development at those particular places.*

The ordinary alternation of day and night growth alone sometimes gives a feeble indication of barring, but I doubt if it would ever be so serious as to call for the consideration of the practical farmer; when, however, it is supplemented by the wrinkling at the places of less density we have a combination of conditions capable of producing all the observed defects. The indentations stop the proper nutrition of the feather at that particular level, and thus greatly intensify the weakening of the growth from the lowered night pressure. The combination is one of reduced nutrition acting as a primary agent supplemented by a secondary mechanical effect, the wrinkling. Both may, and probably do, take place at one and the same time; but we may have the night ring without any bar. The factors which produce a night ring will give rise to a bar when continued far enough.

Evidently the variations in the blood-pressure and the responses to it vary greatly in individual feathers, even among those growing over the same part of the body, and it is this which accounts for the haphazard character of the appearance of the bars alluded to earlier. The variation is difficult to understand, but can be partly explained by the different stages of feather-growth represented at one and the same time in the plumage as a whole, and also by the differences in exposure of the individual feathers. Odd feathers are usually more exposed than those forming part of a full crop, and are always more likely to be barred. Sometimes where a number of feathers are all at the same stage of growth, as in the case of wing and tail feathers after artificial plucking, it is found that a bar will be formed at the same level in all the growing plumes, showing some marked physiological change in the bird as a whole. But usually the barring in individual feathers is quite independent, a fact which adds greatly to the difficulty of overcoming it.

The place of occurrence of the bars and their extent across the flue have also been stated to vary much in single plumes. In the shrinkage, consequent upon the reduction of pressure, it can easily be understood that the wrinklings are not always produced at exactly the same place round the weaker night rings, nor do they always assume exactly the same form and depth; sometimes one deep indentation will occur at a ring, while at others there may be several; some will be on one side of the feather, and some on the other; some partly encircling, others almost completely so. As a result the flue on opening out is differently affected at different levels.

Why the Bars are Always Narrow.

It has been stated that the shrinkage bars are always very narrow in their vertical extent, and this now admits of a simple explanation. They are the same vertical height as the night rings. The latter are always small compared with the day rings, as the feather grows but little during the few hours of the night, and it is only the narrow night part of the

growing feather which is indented to form the bar. A broad bar can never be produced even by continued shrinkage; all that happens in this case is that the sheath wrinkles more and more deeply upon the soft feather and interferes to a greater degree with the formation of the barbules and barbs, and even indents the shaft. The night rings are about a sixteenth of an inch in height, and this is usually the vertical extent of a bar.

PRODUCTION OF THE BARS SOLVED—THE PROBLEM AS TO THEIR PREVENTION.

While in the above account we may claim to have solved the problem as to how the bars in ostrich feathers are produced, there yet remains the greater question as to how their formation is to be prevented, which is really the practical issue with which the farmer is concerned. From what is established we can understand that *the object at which to aim in preventing the bars is to maintain the blood-pressure within the growing feather at as uniform a rate as possible during both day and night: uniformity of conditions during the feather growing period is the key to success in the elimination of the bars.* By maintaining this uniformity we may hope to minimise the difference in the feather growth during the day and night periods, and also give no opportunity for a mechanical collapse consequent upon a considerable reduction of pressure. Anyone acquainted with the physiology of animals will, however, realise the difficulty of maintaining practical uniformity of blood-pressure in organs which project so much beyond the general surface of the body as do the growing feathers of the ostrich, and which at the same time have such a rich supply of blood within them. The great difficulty is to overcome the variations in individual feathers, for usually it is not an interference with the growing feathers as a whole, but merely an example of the slight variation in blood-pressure to which any organ or part of an organ may be subject.

The relationship between blood-pressure and feather perfection in the ostrich appears to be of such a delicate nature that any slight disturbance is productive of faults. Indeed under ordinary farming conditions this delicacy of relationship is never quite maintained, and we rarely get a plume showing perfection of growth. We can, however, enquire as to the conditions under which it is least likely to be disturbed.

In the course of the experiments a great deal of evidence has been accumulated as to the conditions under which the blood-pressure varies, in other words as to the conditions under which bars are and are not produced. As would be expected, the conditions are very varied, but it can be accepted that they are largely, though not wholly, concerned with the nutritive condition of the bird. Something also seems to depend upon the exposure of the individual feather. For it has been seen that odd feathers growing out of time, and therefore not covered and protected by the others in a full crop, are very liable to be barred; also a slight variation in blood-pressure would have a greater proportional effect upon single feathers then upon the members of a full crop.

There is plenty of evidence which proves that with strong vigorous birds kept in a good condition of health, little trouble need be feared from the presence of bars, where a full crop is being produced. The maintenance of the proper nutritive state of the ostrich, however, involves a thorough practical experience of the bird under its various phases, and often individual birds are somewhat out of feather-growing condition when not suspected. What is called for is a strong supply of blood to maintain a constant and regular stream to all the growing feathers under the many variations to which the domesticated bird is subject; anything

which interferes with this is found to have an influence upon the regularity of the growth of the feather. Thus any of a great number of influences may be at work, either together or separately, tending to interfere with the well-being of the bird; and it follows that all the causes which have been assigned by the practical farmer as concerned in the production of bars probably have their justification to a greater or less extent. We need only mention: (*a*) insufficiency of suitable food, especially during droughts; (*b*) ailments and accidents of every kind; (*c*) exposure to inclement weather or to rapid changes of temperature; (*d*) the presence of internal and external parasites and the treatment against them; (*e*) weakening of the constitution by in-breeding; (*f*) lack of variety of food and place; and (*g*) rough handling during the operations of clipping and quilling. Anything in fact which interferes with the proper nutrition of the bird has been proved over and over again to influence the production of the faults. Beyond all these a great deal seems to depend upon the individual constitution of the bird, and even upon the individual feather. Often among birds in the same troop and apparently in equally good condition of health the feathers of some will be barring while others are perfect, and nearly always in a complete crop some plumes will be barred and others free.

Again seasonal changes have often a marked influence on the barring defects. The ostrich is undoubtedly in a more vigorous feather-producing condition at certain times of the year than at others. In the Eastern Province feathers grown during the dry winter months—May to August—are rarely as good and free from bars as those grown in the spring and summer months when green food is abundant.

The defects are just as frequent, if not more so, in superior feathers as in inferior plumes. One often sees high grade feathers deeply barred towards the tip while short, stalky plumes are uniformly grown. Indeed the short stiff feathers occasionally growing alongside high grade feathers are less likely to be barred than the latter. It may be held that the greater the blood supply in the medulla the more likely is the blood pressure to undergo such changes as would result in the production of a bar.

Is the Ostrich More Susceptible to Barring than other Birds.

It may be asked whether the ostrich is more susceptible to feather defects than other birds. It is now well established that bars may be found in a state of nature in the feathers of all kinds of birds, and can be produced artificially by subjecting them to adverse conditions, such as starvation, hence the term "poverty bar" It must be acknowledged, however, that in no bird do they appear to be formed so readily and so consistently as in the ostrich, for they are prevalent in the wild as well as in the domesticated state, and no plumage is ever wholly free from them. In certain other birds, however, I have found that at times the defects are just as plentiful as in the ostrich. Several Black Minorca fowls in my possession have the wing and tail quill-feathers quite as strongly and regularly barred, in proportion to the size of the feather, as in any ostrich plume. There is reason to suppose that in these particular fowls in-breeding has taken place to a considerable degree, and this may have reduced the constitutional vigour. Also in a South American ostrich, *Rhea americana*, in the Albany Museum, the entire plumage, including all the body feathers, is barred in a greater proportion than I have ever observed in the African ostrich.

From a general survey of the situation I am convinced that the production of a perfect plumage is a much more delicate matter in the ostrich than in birds generally. All the wild and domestic birds with

which we are familiar are probably subject to just as many vicissitudes as is the ostrich, and yet faulty feathers are the exception among them, whereas among ostriches their presence is the rule. Even when the utmost care is given to the birds by farmers with years of experience, and with all the best farming conditions available, the feathers are still more or less defective, while under adverse conditions they may be nearly worthless. It can safely be asserted that ostriches under ordinary farming conditions, even where kept in a good state of health, are incapable of producing a plumage entirely free from bar faults, and such would also appear to be the case with the wild bird, so that the trouble cannot be put down to domestication alone. *It is a remarkable biological fact to find that an animal is incapable, even under highly nourished conditions, of producing an important part of its structure in a wholly perfect manner.* Regarded from an evolutionary point of view we may surmise that the feathers of the ostrich, being of no use as organs of flight, are retrograding, that is, it has become of greater advantage for the bird that the nutritive forces should be turned in other directions; and, therefore, we get the very delicate balance of feather nutrition, to be disturbed by the slightest adverse conditions.

I am inclined to consider that climatic changes also have a greater influence upon the ostrich than upon other birds. Its plumage is apparently not well adapted for protecting the body from the great extremes of temperature to which it is subject. Considering the readiness with which the bird erects its feathers on warm days, it would seem that they are not very effectual as a protection against the sun's heat, and we may assume that the plumage is just as ineffectual in the retention of the body-heat during cold weather. Owing to the absence of hooklets on the barbules, the flue of the ostrich, like that of other running birds, is loose in character compared with the compact vane of flying birds; and it can hardly be considered that a loose plumage will serve to protect the body from temperature changes so effectively as an almost air-tight covering. It is significant in this connection that the *Rhea* referred to above as having an intensely barred plumage belongs, like the ostrich, to the flightless birds with loose flue to the feathers. The practical absence of down feathers and filo-plumes in the ostrich, compared with other birds, also needs to be taken into account. The smaller down feathers, which in most birds are interspersed among and below the larger contour feathers, form, as it were, a second plumage which serves for the better retention of the heat of the body; but the ostrich is without this additional protection, having only its single covering of contour feathers. Further, the ostrich has extensive naked areas altogether destitute of feathers, namely, the legs and a large space along each side of the body. Variations of temperature acting upon such an insufficiently protected skin would be extremely likely to modify the blood-pressure, both within the greatly protruding growing feathers and the surface of the skin itself. We need only mention the extreme changes in temperature between the day and night to which South Africa is subject, and even the remarkable changes often from day to day, to be impressed with the influence which temperature must exert upon the ostrich.

The great sensitiveness in the nutrition of the feather and the marked responsiveness to climatic changes, will go hand in hand in producing those variations of blood-pressure within the growing feather which result in the formation of bars; either would be sufficient to produce the faults, but generally they will act conjointly.

One can readily understand that if the ostrich has this natural tendency to the production of faulty feathers, the tendency will be likely to be accentuated under domestication, particularly under the varying and often uncertain farming conditions which prevail in South Africa. The

change from the open wandering existence of the wild bird, free to choose a variety and abundance of food, to the restricted life in camps, often subject to irregularities and limitations in the food supply, can but emphasize any natural weakness towards a defective plumage. The practice of artificial plucking as compared with the natural moulting of the feathers may also be an important factor, though it must always be remembered that on chicks which have never been plucked barring is just as prevalent as on older birds.

If we agree that barring defects are much more prevalent in the plumage of the ostrich than of other birds, and are produced with such readiness, it is manifest that their total elimination under domestication will be a matter of considerable difficulty, and will call for a very thorough knowledge of the responses of the bird to all the varied treatment and conditions to which it is subject. We have, in fact, to counteract a natural tendency within an animal. It is, however, clearly recognised by ostrich breeders that some strains are far more subject to the faults than others, and great advances are now being made in the selection for breeding purposes of parents in which the tendency is least pronounced; also the highly nutritive condition in which superior birds are now maintained is doing much to counteract the evil, so that the solution of the problem of overcoming the tendency to faulty plumage is by no means without its hopefulness. *Farmers are certainly acting wisely in not breeding from birds which show a strong tendency to bars.*

When the farmer has done his utmost to maintain his birds in the best feather-producing condition, there still remains the question whether anything can be done to supplement his efforts, to give him assistance in his endeavours and to render his results more certain. It is towards this that the experiments have been directed for some time, and encouraging results are being obtained. The matter is one of such complexity as to involve a wide experience of ostrich management, and some time must elapse ere the results can be announced with that assurance necessary to warrant their recommendation to the practical farmer. Until under experimental conditions or actual farming practice it is possible wholly to eliminate the bars, it is manifest that the difficulty of analysing the separate barring factors and of providing against them is very great Meanwhile something definite has been achieved in having settled where the trouble lies, and one can proceed with greater assurance and hopefulness in the endeavour to overcome the difficulties presented.

CORRESPONDENCE.

The Fort White Dipping Tank.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—At a meeting of members of the Fort White "Cattle Dipping Tank Syndicate" it was mentioned that in the list of Tanks in the *Agricultural Journal*, you had omitted to mention it. As it was one of the first tanks built in King William's Town District, and having been in use four years with not a single reported loss we are rather proud of it and think it worthy of a place in the list. During four years ending 31st August, 1909, 31,499 cattle and 2,060 horses were dipped with Alderson's Dip which has been very satisfactory and, as stated, without a single reported casuality.

Since the compulsory dipping of cattle has been put in force a great many more cattle have been dipped as the following table will show :—

For year ending 31st August, 1906,	4,454 cattle,	789 horses.
For year ending 31st August, 1907,	6,513 cattle,	248 horses.
For year ending 31st August, 1908,	4,058 cattle,	362 horses.
For year ending 31st August, 1909,	16,474 cattle,	661 horses.

For 1909 the Compulsory Cattle Cleansing Act was put in force in this district and more cattle dipped in this year than in the previous three years combined.—Yours, etc.,

G. A. TEMLETT.

Fort White, September 13, 1909.

S.A. Products at Agricultural Shows.

THE CATERING SYSTEM.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Having seen the circular issued to the various agricultural societies, containing certain suggestions made by Dr. J. H. M. Beck, M.L.A., regarding the use and sale of South African products at agricultural shows, I would go a step further, and insist that the parliamentary grant be made conditional *that only South African products should be sold at these shows.* As a country we are in the position to supply everything necessary and these shows are not likely to accomplish the primary object for which they are maintained, when caterers, for reasons best known to themselves, take so little interest in pushing the sale of South African products, more especially that of our Colonial wines.

To overcome some of the difficulties show committees have to contend with, the luncheon department and cafés should be in the hands of local church committees as is done at Stellenbosch and Paarl, who should also have the right to sell aerated waters. And the sale of liquors tendered for by licensed victuallers at a tariff to be agreed upon, provision being made that light natural wines be sold also by the pint and half pint.—Yours, etc.,

JAMES GRIBBLE.

Paarl, September 20, 1909.

Ostrich Queries.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Can you or any of your readers, kindly inform me whether there is any truth in the statement, that in breeding birds, the progeny take more after the hen, noticeable in shape and quality of feather?

By mating an old cock with a young hen, are they likely to have more male chicks? Does it spoil a bird to cut the feathers, when they bleed?—Yours, etc.,

NOVICE.

Peddie, September 7.

Perhaps some of our experienced correspondents can answer the above queries.

Manures and Manuring.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In the August issue an article appears by Mr. Tribolet on Manuring, which I have read with deep interest and gained much valuable instruction. There are, however, a few puzzles which I am sure Mr. Tribolet will kindly solve.

For instance on page 160 we have a diagram telling us clearly what manures may be mixed, and those that should never be mixed. We find that Basic Slag and Guano are of the latter class, yet on page 163 we are told in four different places the benefits to be derived from such a mixture. Other paradoxes of a similar nature are perpetrated which a single glance will discover. (1.)

On reading the analysis of sheep kraal manure and horse manure I was surprised to see how very inferior the latter is. Now this is a puzzle to me. The stabled horse is fed on such concentrated substances as grain and lucerne, the sheep usually in this country has to forage for itself on the natural herbage of the veld. We are therefore forced to one of the two conclusions, viz., that :—1st the natural herbage is mare strongly charged with such manurial substances as Nitrogen, Phosphoric Acid, Potash and Lime than the grains and dainties which make up the horse's bill of fare; or 2nd, that the digestive powers of the horse are more fitted for extracting those substances than are those of the sheep. What other explanation can there be? (2.)

I have often been told that wood ashes are highly to be recommended as a manure. Mr. Tribolet says very little on this point. I know that these must vary considerably between sample and sample. But generally could you or Mr. Tribolet very kindly give me some rough idea what element usually preponderates in wood ash? I can get it from the local factories for the riding. My veld is poor, sour, sandy with hard sand and clay subsoil. Would wood ash be likely to benefit me? (3.) In my experience with ash I have found, singularly enough, the best kind for garden crops is that derived from the harsh grasses and water bush which abound here in marshy situations. On one occasion I tested it with forage, pumpkins and lucerne with most striking results. We had to clear new ground occupied by this marshy trash, and raked it all in heaps and fired. Where those heaps were all the above crops flourished the very first season, on the surroundings where the beneficent ash had not fallen the crops were the usual stunted unthrifty stuff so familiar to us in the sour veld.

As Mr. Tribolet says, it is the unexpected that so frequently happens here. He says for instance that manuring undrained, sour, badly cultivated spots is love's labour lost, yet I have in marshy situations got a good show of potatoes. It was limed, "Basic Slaged" (if I may use the term), manured and sown at the same time, aye, and "wood-ashed" too. I have drained the spot now because gardening in a quagmire is rightly regarded as labour in vain. However, that was the outcome of that experiment which I would not for the world advise anyone to follow.

Mr. Tribolet must not think that I have written the above in any spirit of depreciation. I have received instruction from his article and beg very much to tender him my thanks.—Yours, etc.,

G. K. GLANVILLE.

Collingham Towers.

(1.) With reference to manures not to be mixed these, naturally, must be applied to the land separately.

(2.) Relative Strength of Manures, Horse and Sheep.—The writer is probably right in his contention, that it is either due to one or the other of the causes he mentions. It might possibly be due to a little of each.

(3.) Wood Ashes.—A good deal depends on the kind of wood from which the ash is obtained. Different woods vary in lime from 42 per cent. to 6 per cent.; in phosphoric acid from 9 per cent. to ·04 per cent.; and in potash from 5 per cent. to ·7 per cent. A good dressing of wood ash, say half a ton to the acre, would greatly improve the sour veld spoken of.—I. TRIBOLET.

Scab and Jackal Proof Fencing.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In one of the previous issues of the *Agricultural Journal* I noticed a letter of Mr. W. E. Murray, of Graaff-Reinet, in which he states that, if he should not be able to eradicate scab from the Colony in one year, he would go and hang himself. Well, I am not opposed to the eradication of scab; however it is easier said than

done. I will give him, say, three years, and in the meantime I think he may have his gallows erected. In my opinion there is a better way of eradicating scab; that is, let us request the Government to take the large amount of money, which is annually spent on the administration of the scab acts, and use it to assist *bona-fide* farmers in erecting jackal-proof fences. In many cases that can be done very easily. That done, jackals may be easily exterminated. Mr. Southey stated recently that, since he had fenced his farm with jackal-proof fences, he was not troubled any more by scab nor by "bloedpens." Such a course would not only rid us of the plague of scab but also promote our pastoral industry enormously. There are farms here which have been clean for the past five to seven years, and which now simultaneously have become infected with scab; this disease prevails this year more than during the past three years. Now, are the few good fruits, which the act has yielded, comparable to the enormous amount of money, which has been wasted? I believe that every farmer knows already by experience to what advantage it is to keep his flocks as clean as possible; in the meantime therefore we might go on without the act. For we have sufficient proof that by allowing sheep to run freely they do not get scab. Besides this measure would save us the precious life of such a practical farmer, who would sacrifice his life for the sake of scab.—Yours, etc.,

JOHN KRUGER.

Rooipoort, Steynsburg, 8th September, 1909.

Permanganate of Potash for Dikkop.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—The following treatment has given most satisfactory results in cases of Dikkop amongst sheep :—Make 3 or 4 incisions where the swelling is most evident, and rub in a few grains of Permanganate of Potash. Keep up the strength of the animal with ½ lb. of mealie meal in 1 bot. water daily, and keep the subject in cool place, this treatment I think will seldom fail. This remedy is commonly used for snake bites and is conveniently got up in a wooden case with lancet at 1s.—Yours, etc.,

A. W. SEPHTON.

Maclear, September 20, 1909.

Where do the Tortoises go?

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I should be very much obliged if you or any of your correspondents could give me some information through your valuable *Journal* of the following subject.

In this part of the country during the rainy season the turtle (? Tortoise) finds its abode in the numberless pans and lagoons, but when these dry up it disappears. What I should like to know is where do these creatures come from and where do they eventually go to. Thanking you in anticipation,—Yours, etc.,

M. TURNER.

Floradale, Hay.

A Correction.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I looked over the *Agricultural Journal* for September and I notice you gave me credit for 25,000 sheep. I must have made a slip, it is only 7,000 and 25,000 acres of land adjoining the Government stock farm.

Hoping you will correct the error.—Yours, etc.,

F. E. DOERING.

Johannesburg, September 20.

Boring for Water in the Beaufort West District.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—By inserting this letter in the *Agricultural Journal*, you will greatly oblige me. I wish to draw the attention of farmers in the dry parts of Beaufort West and Prince Albert districts to the fact that they should busy themselves more with boring for water. Recently Mr. N. F. Marais bored on the farm of Mr. Frederik Marais, Wilgefontein, to a depth of 133 feet and obtained 2¼ inch of water, and at Schoenmakerswinkel, district Beaufort West , farm of Mr. H. W. Botes, he bored to a depth of 60 feet, obtaining 3½ inches of water. The farms referred to are not at a great distance from the railway station, and they can have now fine gardens. In that way those farms have benefited certainly to an amount of from four to five hundred pounds.—I am, etc.,

J. S. DE VILLIERS, SEN.

Beaufort West, September 20. 1909.

Extermination of Jackals.

To the Editor, AGRICULTURAL JOURNAL.

SIR,— With reference to Mr. Visagie's letter in your September issue complaining of ineffective Jackal Poison, if he will use Hulle's Strychnine Capsules he will have no cause for further complaint. They are prepared in accordance with the recommendation of a South African farmer and they have given every satisfaction. A bottle containing 50 capsules may be obtained from any licensed storekeeper for 5s. ; Midland merchants can obtain supplies from the undersigned who are the Sole Agents.—Yours, etc.,

HAYWARD, YOUNG & CO.

Port Elizabeth, September 23rd, 1909.

Festuca elatior, true Rhenish Tall Fescue or Tussock Grass.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Perhaps it will be of interest to the readers of your *Journal* to hear that the new crop of *the true Rhenish Tall Fescue* is now brought in.

The seed is of excellent quality, heavy grain and of a very fine colour. The true variety is only grown in a very small district just in my next neighbourhood near the Rhine, and the principal farmers, growing this sort, are my regular suppliers for long years past. I was again able to obtain the greater part of the new crop and I am now occupied with cleaning, grading and dressing the seed in my well fitted cleaning department on a very large scale and in a most rational manner up to the various grades of quality.

Festuca elatior becomes more and more known in all parts of the world on account of its high agricultural value, being much preferred to the Meadow Fescue. England and America is always a good customer and the last few years my sales to your country are also increasing.

This season the demand will surely be very lively as Meadow Fescue brought a short crop and is offered at very high figures, and I expect that prices may rise steadily in the course of this season, so that it can be recommended to cover requirements very early.

My first lots of the new seed will be ready about the middle of this month. I hold samples and prices at the disposal of everyone interested.—Yours, etc.,

CONRAD APPEL,
Wholesale Grass Seed Dealer.

Darmstadt, Germany, September 8.

Divining and Drilling.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I shall be obliged by your inserting this letter in the *Agricultural Journal* in reply to a letter of Mr Frank May, who inquires in the September issue of the *Journal*, how things now stand in relation to the communications between Mr. St. Leger Seaton and myself, which appeared in previous issues of the *Journal*. In reply to Mr. May I wish to state that I really don't know what has become of Mr. St. Leger Seaton; whether he is dead or has a mortal fright. I am not aware of, but this I know that he has remained as silent as death since the arrogant challenge. I would have thought a man, who has been writing about so much experience, would not have remained so silent now the time has come to prove what he has been writing about so sprightly. If he is still the same man, as he has set himself up for, I am any day prepared to fulfill my promise. Thanking you in anticipation.—Yours, etc.,

L. C. NEL.

Weltevreden, 3rd October, 1909.

APPLICATIONS FOR AGRICULTURAL EMPLOYMENT.

Strong, healthy, Colonial youth, with several years experience of general Stock and Dairy Farming seeks employment. Knows Dutch well. Reply L. Liski, Henley Lodge, Three Anchor Bay, Capetown.

Student at Elsenburg Agricultural College requires situation on a Dairy or Stock Farm. Completing full course in December next. Took 1st prize for butter making at Rosebank Agricultural Show, 1909.—Apply, G. F. Fox, Elsenburg College, Mulder's Vlei.

*Elsenburg Student completing full course at end of year, seeks employment on Stock Farm. 20 years of age. Reply to C. L. Bousfield, Elsenburg College, Mulder's Vlei.

*Elsenburg Student, 18 years old, completing full course in November, seeks employment on a Stock Farm. Was brought up on a farm and speaks Dutch fluently. Reply to C. Mugglestone, Elsenburg College, Mulder's Vlei.

*Elsenburg Student, 20 years of age, completing full course at end of year, seeks employment on Stock Farm. Speaks Dutch fluently. Reply to Ned Kelly, Elsenburg College, Mulder's Vlei.

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*Elsenburg Student, 19 years of age, completing full course at end of year, seeks employment on farm. Speaks Dutch. Reply to S. G. B. Campbell, Elsenburg College, Mulder's Vlei.

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*Elsenburg Student, 20 years old, completing full course at end of year, seeks employment on Stock Farm. Brought up on a farm and speaks Kafir.—Reply to S. Thomas, Elsenburg College, Mulder's Vlei.

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*Elsenburg Student, completing full course at end of year, desires employment on farm. Former experience on Wine Farm. Matriculated. Fair knowledge of Dutch.—Reply L. de Wet, Elsenburg, Mulder's Vlei.

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*Elsenburg Student, 19 years of age, completing full course at end of year, desires employment on a farm.—Reply to H. W. Irwin, Elsenburg College, Mulder's Vlei.

---

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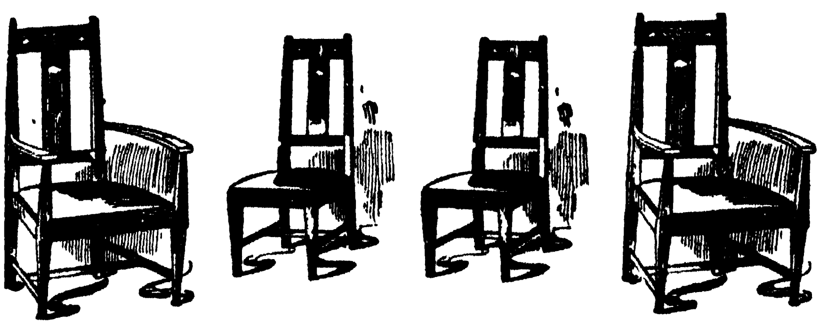

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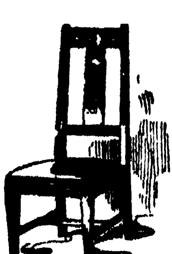

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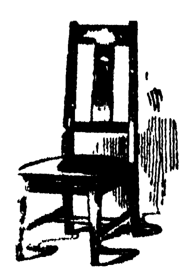

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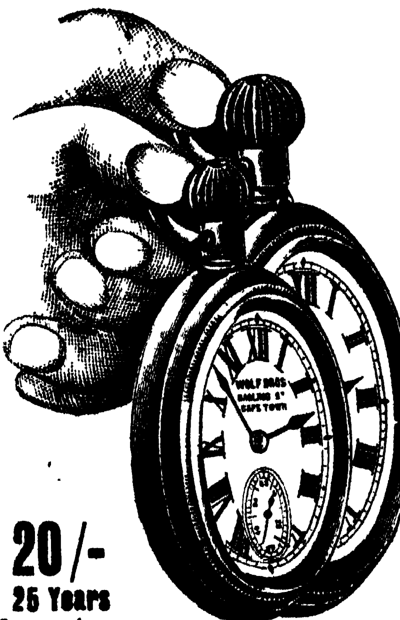

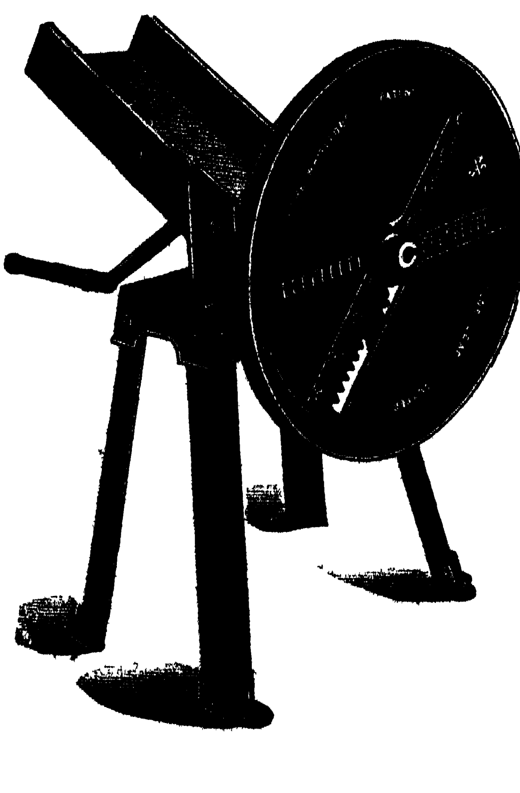

NOTES ON THE WEATHER OF AUGUST, 1909.

By CHARLES M. STEWART, B Sc., Secretary to the Meteorological Commission.

A mean atmospheric pressure considerably below the normal; a monthly temperature less than usual with warm days and cold nights; a mean rainfall considerably above the average in the west and south with a serious deficiency amounting to partial or absolute drought over practically the whole of the rest of the Colony; few thunderstorms, with some hail; comparatively little fog or mist; some snow and sleet at the beginning and end of the second week of the month; frosts of practically daily occurrence but less severe and wide-spread than during July; strong winds particularly during the first half of the month, a few hot winds and duststorms, were the most noteworthy features of the weather of August, 1909.

DIVISION.	Mean Rainfall (1909).	Mean No. of Days.	Average Rainfall (1891-1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	11·58	18	5·94	12	+5·64	+ 95
South-West ...	5·30	12	3·24	8	+2·06	+ 64
West Coast ...	3·61	9	1·44	5	+2·17	+151
South Coast ...	2·62	7	2·16	6	+0·46	+ 21
Southern Karoo ...	0·67	3	0·85	3	—0·18	— 21
West Central Karoo ...	0·41	2	0·48	2	—0·07	— 15
East Central Karoo ...	0·11	1	0·71	2	—0·60	— 84
Northern Karoo ...	0·20	1	0·52	2	—0·32	— 62
Northern Border ...	0·03	1	0·25	1	—0·22	— 88
South-East ...	0·58	3	1·39	4	—0·81	— 58
North-East ...	0·09	1	1·17	3	—1·08	— 92
Kaffraria ...	0·12	1	1·22	4	—1·10	— 90
Basutoland ...	0·13	2	1·15	3	—1·02	— 89
Orange River Colony...	...	...	0·69	2	...	...
Durban (Natal) ...	0·11	3	1·93	...	—1·82	— 94
Bechuanaland ...	0·46	1	0·36	2	+0·10	+ 28
Rhodesia ...	0·00	0	0·11	1	—0·11	—100

Precipitation.—The mean rainfall, as shown by returns from 338 stations, was 2·28 ins. on 5 days, being 0·72 in. or 46 per cent. above the normal. This mean is 1·40 in. more than the corresponding quantity recorded during the previous month and 0·78 in. more than in August of last year. The accompanying table shows, however, its distribution was purely that of a Winter rainfall, the excess being confined to the Cape Peninsula, the South-West, the West and South Coasts (together with Bechuanaland), and varying between 151 per cent. over the West Coast and 21 per cent. over the South Coast. Elsewhere there was a serious deficit ranging from *minus* 15 per cent. over the West Central Karoo to *minus* 100 per cent. in Rhodesia, being above 80 per cent. over the greater number of the remaining sections of the country. Compared with the preceding month, the divisional means show increased quantities, except in Kaffraria, Rhodesia and at Durban (Natal), where there has been a diminution of the rainfall recorded. Contrasted with August, 1908, the mean precipitation shows an increase over the Cape Peninsula, the South-West, the West Coast, the West Central Karoo and Bechuanaland, but diminished quantities elsewhere. As a matter of fact it will be seen that with the exception of the first four divisions, the mean rainfall was considerably under an inch. That a long and serious drought has prevailed over the north and east of the Colony is well brought out by an examination of the totals recorded for June, July and August, from which it appears that of 225 stations situated in sections 7—13 and 17, fifty-two (52) or 23 per cent. recorded "no rainfall" during these three months; doubtless this proportion would be considerably

greater but for the fact that the returns for a number of the stations are incomplete for this period. At many other stations the total amount recorded during these months is an almost negligible quantity. Summarising the monthly totals, it is found that of 338 stations 59 suffered from "absolute drought" and 130 from "partial drought" during the month; of the remainder, 22 had 0·51—1·00 in.; 24 had 1·01—2 ins.; 25 had 2·01—3 ins.; 16 had 3·01—4 ins.; 18 had 4·01—6 ins.; 16 had 6·01—8 ins.; 5 had 8·01—10 ins.; 8 had 10·01—12 ins.; 6 had 12·01—14 ins.; 5 had 14·01—19 ins.; whilst four (4) had over 19 ins., viz., Waai Kopje, 19·06 ins.; Waai Vlei, 19·37 ins.; Bishopscourt, 19·84 ins.; Maclear's Beacon (Table Mountani), 23·42 ins. Monthly totals of more than six inches (6 ins.) were confined to the Cape Peninsula, South-West and West Coast, and quantities exceeding 14 ins. entirely to the Cape Peninsula. On similarly treating the maximum amounts recorded in 24 hours, it is seen that of 330 stations furnishing the necessary particulars, 214, or almost two-thirds had maxima ranging between 0·50 in. and Nil; 43 had 0·51—1·00 in.; 52 had 1·01—2 ins.; 17 had 2·01—3 ins.; the remaining four (4) having more than three inches on one day were Algeria (Clanwilliam), 3·30 ins. on 8th; Bishopscourt, 3·32 ins. on 7th; Newlands, 3·33 ins. on 10th; and Ceres, 3·70 ins. on 5th. The nett result of these heavy rains in the West and South, judging from the reports received, seems to be a marked improvement in the prospects for fruit and cereal crops, and in the condition of the veld; whereas elsewhere there is great need for rain, although, generally speaking, veld and stock are in fair condition owing to the heavy rains of summer and autumn. *Thunderstorms* were comparatively few in number and limited in distribution, only thirty one (31) being noted on 14 days, 1st to 6th, 9th, 12th to 15th, 21st, 28th and 29th, but mostly on 6th and 13th. *Hail* was somewhat more common than usual, being reported from 23 stations on 6 days, principally the 14th and 9th. *Snow* fell at 72 stations on 11 days, notably 14th and 15th and 9th, and was apparently accompanied by *Sleet* at other stations on these days,—this latter phenomenon being reported from 21 stations on 6 days, mostly on 14th and 15th. The snowfall of the 14th and 15th appears to have occurred over an unusually wide area, being noted at the hi.her stations from Lilyfontein on the Kamies Berg in the West to Kokstad in the East, and from the latitude of the Zwartberg Pass in the South to the neighbourhood of Mafeking, in the North, where such a fall is not remembered by any white inhabitant. The greatest depth reported was three inches at De Kruis (Div. Murraysburg) on 15th; it was 2½ ins. at Lilyfontein on 14th, and 2 ins. at the same station on 8th; also 2 ins. at Cheviot Fells on 15th; and 1¼ ins. at Hartebeestfontein on the same date; the ground was reported white at Dunedin and Zwartberg Pass on 10th; at Bloemhof, Willow Walk, Barkly East on 14th; at Fort Fordyce and Sterkspruit on 15th.

Temperature, Cloud and Wind.—The mean temperature for the month, based on all available returns, was 55·4° which is 1·4° higher than last month, and 0·8° warmer than during August, 1908. The mean maximum (67·6°) is 1·9° higher and the mean minimum (43·2°) is 0·9° higher than the correcponding values for July last, so that both day and night temperatures are once more on the up-grade. The greater warmth, compared with the corresponding month of last year, is mainly due to the mean maximum being 1·8° higher, whilst the morning temperatures were actually 0·2° lower than during the previous August. Compared with the normals, the day temperatures were 0·6° higher and the night temperatures 1·4° lower than usual, thus causing the mean for the month to be 0·4° less than the average and increasing the mean daily range by 2·0°. Speaking generally, it may be said that the monthly temperatures were below the averages in the West and South by 1—2 degrees, but above the normals in the East and Centre by smaller amounts, mostly fractions of a degree. To this general statement, however, there are some notable exceptions, thus the Royal Observatory was 1·3° warmer than usual; Hanover was 1·7° colder, and Hopefontain (Rhodesia) 3·0° warmer than the average. The day temperatures were mostly below the normal at stations in the West by 2—4 degrees, the deficit, however, decreasing along the South Coast, occasionally being converted into an excess; in the East and Centre the days were warmer than usual by varying amounts, ranging from 0·4° at East London to 5·4° at Umtata. The nights were mostly colder by 1—2 degrees in the West and South and at many stations in the East, the deficit increasing, however, to 4° at Hanover and 4·3° at Umtata. On the other hand, a few stations, such as Sydney's Hope, Stutterheim, Kokstad, Hopefountain, etc., had mean minima higher than the average by 1—2 degrees. The mean warmest station was Hope Fountain (Rhodesia) with 62·9° and the mean coldest, Disa Head with 46·8°, a difference of 16·1°. The highest mean maximum of 79·6° belongs to Mochudi, and the lowest mean minimum, 26·6°, to Hanover. The highest temperature readings for the month were registered on seventeen days, mostly during the last fortnight and particularly on 20th, 21st, 27th and 28th. The lowest readings noted occurred on 13 days, more especially during a cold spell from 15th to 18th, but mostly on the 15th. The mean of the highest readings was 82·1° or 3·9° higher than last month and 0·9° higher than the previous August; while the mean value of the extreme minima was 34·2°, that is 1·5° higher than in July last and 0·4° higher than during the corresponding month

of 1908. The mean monthly range was therefore 47·9°. The extreme temperatures recorded were 95·0° at Umtata on 28th and 16·0° at Hanover on 11th, giving an extreme monthly range of 79° over all the stations. *Frosts* were noted as occurring at one or more places on each day of the month with the exception of the 8th; 197 instances were noted, most numerously on 16th to 18th, 10th, 11th, 1st and 30th. This number is just about half that reported in July but more than three times the number noted in August, 1908. A Hottentot is reported to have died from exposure at Hopetown on 15th. At Theefontein (Div Hanover) the fruit trees are reported to be late in budding and the crops backward; at Vruchtbaar (Div. Wellington) it is stated that the season for fruit will be late as only the very early varieties are blooming; whereas from Carnarvon Farm comes the report that "there has been an unusually good blossoming for all fruit trees; none killed up to date." At Retreat (Cape Peninsula) the mean temperature on Grass was 42·2°, or 3·2° higher than in July; this thermometer fell below freezing point on only two occasions, 1st and 3rd, the lowest reading being 30·2° on 1st, when hoar-frost was noticed on the vegetation.

The mean *Cloudiness* for the month was only 36 per cent., which is 5 per cent. more than in July, but 7 per cent. less than the previous August The sky was most obscured over the Cape Peninsula, where the mean amount of cloud was 66 per cent.; it decreased to 52 per cent. in the West and South West, to 36 per cent along South Coast and 32 per cent. in the South East, being mostly 20 -25 per cent. elsewhere The station with the largest proportion of cloud was Disa Head (Table Mountain) where it amounted to 72 per cent., and the clearest skies were experienced at Hopefountain where the mean cloudiness for the month was only 4 per cent, Tabankulu coming next with 10 per cent. *Fogs* and *Mists* were mostly of local occurrence, 75 instances being noted on 29 days, principally 28th and 5th, being slightly more than in July, but fewer than during the previous August The only two days devoid of fog were 2nd and 4th.

The prevailing morning *Winds* were S E. at Port Nolloth, Hopefountain, S'ly at Kuruman, S.W. at Kimberley, Stutterheim, Bedford, N E'ly at Mochudi, E'ly at Teyateyaneng, and N.W'ly (N. to W.) at all the remaining stations The mean *Force* on the Beaufort Scale was 2·35 corresponding to a mean velocity of 14·75 mile per hour, being 1·8 and 1·75 mile per hour less than in July and the previous August respectively. The winds were strongest in the South and West and decreased in intensity eastwards and towards th einterior At the Royal Observatory, the prevalant wind-directions were N. and N.W., there being also a slight increase in frequency of those from S.S.E. and W.N.W.; one of the most striking features was the practical absence of S'ly winds, these being 17 per cent. less frequent than usual The mean force was 1·81 corresponding to a velocity of 12·05 miles per hour or 0·35 mile per hour less than the average. *Gales* and strong winds were unusually frequent, being reported from 87 stations on 18 days, most widely on 14th and 6th, although fairly common during the first 10 days of the month, 13th to 16th and 31st The hospital at Kokstad was burned down in half an hour during a hot gale on 6th. *Hot Winds* were reported from 10 stations on 10 days and *Duststorms* from 11 stations on 6 days, chiefly 31st.

The mean barometric pressure at the Royal Observatory was only 30·09 ins., or 0·06 in. less than usual, ranging from 29·72 at 8.30 p.m on 7th to 30·59 ins. at 8.30 a.m. on 16th.

Earthquake Shocks were experienced at Hopefountain at 10.40 a.m. on 5th and at Hopetown at 10.30 p.m. on 15th.

OBSERVERS' NOTES.

VRUCHTBAAR.—After the excellent rainfall of this month, we may look forward to good fruit and cereal crops in this District. The season for fruit will be late as only the very early varieties are blooming.

ALGERIA (Clanwilliam).—Generally speaking the weather has been very cold and wet throughout the month.

KERSEFONTEIN (Piquetberg).—A record August rainfall; whereas January--July gave 4·32 ins., August shows 4·09 ins. The difference in crops and veld is in equal proportion.

VAN RHYN'S DORP.—Great improvement in crops and stock.

UITENHAGE PARK.—A variable month, seven frosty mornings, four hot winds, two duststorms and a larger rainfall than usual.

THEEFONTEIN (Hanover).—Frosts—sometimes with thick ice—occurred on 23 nights. Half a gale on 6th and 14th from W. and N.W. Weather very changeable. Warm Northerly winds bringing up clouds and then veering to W. and S.W., ending in a cold spell with clear sky. Fruit trees very late in budding. Crops backward. Lambing season good, except in a few cases where Bloedpens was troublesome; no remedy yet being found for the disease. Rain wanted.

VARKEN'S KOP (Middelburg).—Some frosts during month. Strong Northerly winds prevalent. Country dry. Stock in good condition.

HOPETOWN.—Morning of 15th Hottentot died of exposure. Reported seismological disturbance on evening of 15th; did not awake the observer, who had already retired.

ALEXANDRIA.—Little or no crops. No prevalent disease.

DAGGA BOER (Bedford).—Heavy North-West wind nearly all through the month, warm, only three frosts. Very dry, crops all require watering and rain.

HUXLEY (Stutterheim).—Very dry, rain wanted. Stock very thin but healthy.

BOLOTWA (Contest).—Three months absolute drought—May 29th to August 31st—which is very unusual here. Notwithstanding this, veld starting well and stock in fair condition. Crops suffering but still alive and if rain comes may do well. Ground still moist underneath from soaking rains of summer and autumn.

LADY GREY.—The strong wind on the 8th took roofs off the houses and damaged trees.

SUNNYMEADE (Albert).—Very cold during month. Strong winds from all quarters bringing up snow clouds, but very little moisture has fallen in these parts. Stock doing well. Rain is badly needed.

KOKSTAD.—Very dry with hot Westerly gales during the month.

SLAATE.—On the whole a windy season and hot, the thermometer going up to 85° F. and below freezing point in the verandah, frequently.

NOTHINGHAM (Mafeking).—Weather very cold middle of month. Snow reported to have fallen in parts of District. A similar fall is not remembered by any white inhabitant.

GROOT DRAKENSTEIN.—A cold wet month, the maximum being nearly 2° below the normal. The rainfall largely in excess, viz., 60 per cent. This will help to make up the large deficiency experienced so far this year. Mean temperature of month 0·8 below the average. Rainfall 2·98 ins. above the average Total rain fall to date 24·09 ins.

STUTTERHEIM.—Rain badly needed. Stock dying of poverty in certain localities. Measles prevalent.

KOKSTAD (Coyte).—There have been a number of heavy gales and hot winds. Several large grass fires have destroyed a large extent of grass. During a hot gale on the 6th the local hospital was burnt down in half an hour. Some snow fell on the morning of the 15th, but not sufficient to lie on the ground. Rain is very badly needed.

HOPE FOUNTAIN.—On the 5th at about 10.40 a distinct tremor of the earth was felt, with a continuous sound like a huge motor car pounding along on the South corner of the house. The iron of the roof rattled on the N.W. side of the house; in the sitting room the plants in pots shook and in Mrs. William's house, about 300 yards N.W., the crockery rattled and the couch on which she was sitting, gave a distinct heave. Many of the natives heard the rumble and tried to account for it in various ways, some went outside to see the motor car, others thought it was some machinery in a mine about 4 miles off.

CARNARVON FARM.—Another rotten August is past. We have never had so little as 16 points for three consecutive months before, *i.e.* June, July and August. The June sleet and snow showers did no good whatever. Stock are falling off a lot, especially small stock, and unless good rains in September the lambing season will be a failure as well as the wheat crops. Most of these not under irrigation are done for. There has been an unusually good blossoming for all fruit trees. None killed up to date. Lucerne craze still on. Most farmers adding steadily year by year.

	Rain.	Wind.	Frosts.	No Clouds.
1901	0·54	14	13	7
1902	0·22	22	9	3
1903	0·12	17	9	3
1904	0·29	16	19	10
1905	0·67	16	15	2
1906	0·09	21	27	11
1907	0·02	12	17	9
1908	0·21	25	10	5
1909	0·16	14	23	6
Totals	2·32	157	142	56
Means	0·26	17·5	16	6

STERKSPRUIT (Herschel).—This is the ploughing month, but little done as rain not considered sufficient. Severe epedimic of influenza throughout district. Several deaths in village near Bensonvale Institute. Report spread amongst scholars that it was plague and about 30 boys fled in terror to their homes. They eventually returned, ashamed.

Stations.		Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory	...	65·6	48·2	56·9	71·8	20	40·9	1
Cape Town (S.A.C.)	...	62·1	49·4	55·8	82·5	20	45·0	12, 13 & 15
Blaauwberg	...	60·7	48·2	54·4	73·0	20	42·0	15
Table Mountain (Disa Head)		51·9	41·6	46·8	70·2	20	33·5	16
Do. (Devil's Peak)		55·7	42·9	49·3	76·0	20	35·0	15
Wynberg	...	61·7	47·2	54·4	72·2	20	41·2	15
Groot Constantia	...	59·9	47·5	53·7	71·0	20	43·0	15 & 16
Retreat	...	62·2	46·9	54·6	68·7	1	36·4	1
Groot Drakenstein	...	62·2	43·9	53·0	82·9	20	36·9	16
Danger Point	...	61·5	49·6	55·5	72·0	7	40·0	15
Elsenberg (Agri. College)	...	60·2	45·5	52·8	78·1	20	39·1	15
Robertson Plantation	...	68·2	42·4	55·3	78·0	27	32·0	15
Malmesbury	...	62·1	43·4	52·8	78·8	20	35·0	1
O'okiep	...	62·6	40·6	51·6	77·8	25	30·6	10
Port Nolloth	...	61·5	44·1	52·8	82·0	19	37·5	3
George (Plantation)	...	67·4	46·3	56·8	85·5	21	40·0	17
Dunbrody	...	74·5	40·0	57·2	91·3	21	30·6	1
Van Staaden's	...	70·2	44·4	57·3	88·0	28	37·0	15
Cape Agulhas	...	61·0	49·3	55·2	70·0	22	45·0	15 & 17
Concordia (Plantation)	...	68·1	46·9	57·5	86·6	21	39·9	15
Port Elizabeth	...	67·1	48·5	57·8	81·0	8	42·0	15
Heidelberg	...	68·9	39·8	54·4	86·0	21	34·0	27
Uitenhage	...	73·9	40·6	57·2	91·0	27	31·5	7
Cape St. Francis	...	67·5	50·9	59·2	85·0	21	38·0	13
Storm's River	...	67·3	43·9	55·6	89·0	21	37·0	17
Amalienstein	...	69·4	37·1	53·2	84·0	21	28·0	1 & 3
Hanover	...	65·5	26·6	46·0	78·0	26, 29 & 30	16·0	11
Kimberley	...	72·3	39·1	55·7	85·9	23	27·0	11
Sydney's Hope	...	69·4	46·9	58·2	88·0	27	34·0	15
Cathcart	...	66·8	39·1	53·0	79·8	27	28·2	3
Stutterheim	...	73·0	44·9	59·0	88·5	28	35·0	1
Bedford	...	71·8	42·3	57·0	88·0	25 & 28	31·0	3 & 12
Lovedale	...	73·6	40·2	56·9	93·0	27	32·0	1
Chiselhurst	...	75·5	47·5	61·5	88·0	22	42·0	6 & 15
Evelyn Valley	...	67·3	44·4	55·8	84·0	28	31·0	15
East London	...	69·9	48·6	59·2	77·0	23	41·0	7
Aliwal North	...	70·5	32·7	51·6	83·0	24	19·0	11
Rietfontein (Aliwal N.)	...	64·9	33·6	49·2	77·3	24	21·5	11
Port St. John's	...	72·9	49·6	61·2	83·0	26	44·0	18
Tabankulu	...	72·9	43·6	58·2	86·5	31	31·0	16
Umtata	...	77·5	37·7	57·6	95·0	28	29·0	17
Kokstad	...	71·2	36·9	54·0	85·0	24	25·1	16
Main	...	72·4	41·3	56·8	88·5	28	31·5	16 & 17
		66·5	37·0	51·8	78·0	22 & 24	23·0	15
Mochudi (Station)		79·6	41·3	60·4	90·0	30	26·0	16
Kuruman		72·4	39·2	55·8	83·0	24 & 27	29·0	11 & 15
Hope Fountain		78·3	47·5	62·9	87·6	14	42·0	6
		67·6	43·2	55·4	82·1	...	34·2	
		...	...	...	95·0	28	16·0	11

RAINFALL, AUGUST, 1909.

I. CAPE PENINSULA:

	INS.
Royal Observatory (*a*) 12in. gauge	7·32
Cape Town, Fire Station	7·20
Do. South African College	9·23
Do. Molteno Reservoir	·18
Do. Platteklip	·66
Do. Signal Hill	·52
Sea Point, The Hall	·30
Camp's Bay	·26
Table Mountain, Disa Head ..	·45
Do. Kasteel Poort..	·95
Do. Waai Kopje ..	·06
Do. St. Michael's ..	·44
Devil's Peak, Blockhouse ..	·62
Do. Nursery	·68
Woodstock (The Hall)... . ..	·50
Do. (Municipal Quarry)	·82
Do. (Do. Nipher's Shield)	10·36
Newlands, Montebello ...	·94
Bishopscourt	·84
Kenilworth	·59
Wynberg, St. Mary's ...	·76
Groot Constantia	·97
Tokai Plantation	·13
Plumstead, Culmwood ...	·79
Muizenberg (St. Res.) ..	·73
Cape Point...	2 27
Blaauwberg Strand	5·44
Durbanville	7 64
Maitland Cemetery	7 28
Tamboers Kloof	9 25
Woodhead Tunnel...	11 94

II. SOUTH-WEST:

	INS.
Eerste River	6·14
Klapmuts	7·08
Stellenbosch, Gaol	7·14
Somerset West	7·46
Paarl	6·89
Wellington, Gaol	5·28
Groot Drakenstein, Weltevreden	7·93
Tulbagh	5·00
Kluitjes Kraal	5·84
Ceres	13·28
The Oaks	4·91
Rawsonville	5·81
Caledon	3·42
Worcester, Gaol	3·39
Hex River	4·82
Karnmelks River	2·42
Lady Grey, Div. Robertson ...	1·98
Robertson, Gaol	2·30
Do. Govt. Plantation ...	2·17
De Hoop	2·22
Montagu	2·13
Danger Point	3·62
Elgin Plantation	9·87
Elsenberg Agricultural College...	6·30
Roskeen	4·05
Vruchtbaar	8·30

III. WEST COAST:

	INS.
Port Nolloth (Lieut. Barber) ...	0·15
Anenous	1·75
Klipfontein	0·95
Kraaifontein	1·50

III. WEST COAST (*continued*):

	INS.
O'okiep	1·86
Springbokfontein	3·14
Garies	2·82
Lilyfontein	3·95
Van Rhyn's Dorp	·59
Clanwilliam, Gaol ..	·77
Dassen Island	·81
Kersefontein	·09
The Towers ..	·89
Piquetberg	6·20
Wupperthal	4·26
Welbedacht .. .	3·27
Hopefield	3·10
Algeria (Clanwilliam) ...	6·59
Cedarberg (do.) ...	10·90

IV. SOUTH COAST:

	INS.
Cape Agulhas	2·40
Bredasdorp...	2·70
Swellendam	2·39
Grootvaders Bosch ...	2·05
Heidelberg	07
Riversdale	75
Vogel Vlei	84
Mossel Bay...	78
Great Brak River.. ..	36
George	2·23
Woodifield (George) ..	2·20
Millwood	3·08
Sour Flats	2·30
Concordia	3·01
Knysna	2·00
Buffel's Nek . ..	3·87
Plettenberg Bay	3·83
Harkerville	4·92
Blaauwkrantz	4·78
Lottering	3·96
Witte Els Bosch	5·71
Humansdorp	2·83
Cape St. Francis	3·15
Van Staden's, Intake ..	2·87
Do. On Hill ...	2·83
Uitenhage (Gaol)	1·59
Do. (Park) ...	1·54
Do. (Inggs) ...	1·42
Armadale (Blue Cliff) ...	0·68
Dunbrody	0·82
Port Elizabeth (Harbour) ...	3·16
Do. (Victoria Park)	2·61
Do. (Walm r Heights)	3·11
Centlivres	0·86
Edinburgh (Knysna)	4·00

V. SOUTHERN KAROO:

	INS.
Ladismith ...	1·02
Amalienstein	0·88
Oudtshoorn	0·35
Vlaakte Plaats	1·08
Uniondale ...	0·67
Kleinpoort	0·00

.I. WEST-CENTRAL KAROO

	INS.
Prince Albert	0·49
Zwartberg Pass	3·00
Beaufort West, Gaol	0.10

VI. WEST-CENTRAL KAROO: *contd.*

	INS
Dunedin	0·10
Nel's Poort	0·14
Camfers Kraal	0·20
Krom River	0·11
Roos Plaats	0·12
Willowmore	0·19
Rietfontein	0·04
Steytlerville	0·00

VII. EAST-CENTRAL KAROO.

Aberdeen, Gaol	0·00
Aberdeen Road	0·00
Winterhoek	0·00
Klipdrift	0·00
Kendrew, Holmes	0·18
Graaff-Reinet, Gaol	0·18
Do. (Eng. Yard)	0·17
New Bethesda	0·07
Roodebloem	0·03
Glen Harry	0.16
Wellwood	0·30
Bloemhof	0·19
Jansenville	0·00
Roode Hoogte	0·03
Toegedacht	0.00
Klipfontein	0·10
Pearston	0·08
Middlewater	0·34
Somerset East, Goal	0·39
Cookhouse	0·05
Middleton	0·14
Spitzkop (Graaff-Reinet)	0·10
Bruintjes Hoogte	0·19
Zeekoe River	0·04

VIII. NORTHERN KAROO:

Calvinia	1·73
Middlepost	0·54
Sutherland	2·02
Fraserburg	0·12
Carnarvon	0·12
Brakfontein	0·00
Victoria West	0·00
Britstown	0·03
Wildebeestkooij	0·00
De Kruis, Murraysburg	0·02
Richmond	0·14
Hanover	0·08
Theefontein	0·00
Philipstown	0·00
Petrusville	0·00
The Willows, Middelburg	0·00
Colesberg	0·00
Varkens Kop	0·07
Cradock (Gaol)	0·04
Maraisburg	0·00
Steynsburg (Gaol)	0·12
Tarkastad	0·33
Drummond Park	0·00
Waverley	0·04
Schuilhoek	0·07
Vosburg	0·06
Zwavelfontein	0·04
Hartebeestefontein	0·00
Willow Walk	0·27
Hotweg Kloof	0·23
Thebus Waters	0·09

IX. NORTHERN BORDER:

Pella	0·12
The Halt	0·00
Kenhardt	0·02
Upington	0·00
Trooilapspan	0·00
Van Wijk's Vlei	0·04
Prieska	0·00
New Year's Kraal	0·06
Dunmurry	0·00
Griquatown	0·09
Douglas	0·06
Hope Town	0·04
Newlands, Barkly West	0·00
Kimberley (Gaol)	0·00
Do. Stephens	0·00
Strydenburg	0·00
Rietfontein	0·00
Douglas (Vos)	0·05
Mazelsfontein (Div. Herbert)	0·10
Rocklands	0·00

X. SOUTH EAST:

Melrose (Div. Bedford)	0·02
Dagga Boer	0·03
Fairholt	0·15
Alicedale	1·04
Cheviot Fells	0·36
Bedford (Gaol)	0·38
Do. (Hall)	0·35
Sydney's Hope	2·12
Adelaide	0·18
Atherstone	1·00
Alexandria	2·54
Fort Fordyce	0·26
Graham's Town (Gaol)	1·54
Heatherton Towers	0·33
Sunnyside	1·00
Fort Beaufort	0·25
Katberg	0·92
Seymour	0·35
Glencairn	0·94
Lovedale	0·23
Port Alfred	1·94
Hogsback	1·78
Peddie	0·80
Exwell Park	0·00
Keiskamma Hoek	0·58
Cathcart (Gaol)	0·15
Cathcart (Forman)	0·05
Cathcart	0·19
Thaba N'doda	0·90
Evelyn Valley	2·68
Crawley	0·05
Perie Forest	1·14
Isidenge	0·79
Kologha	0·88
King William's Town (Gaol)	0·52
Stutterheim (Bousfield)	0·28
Fort Cunynghame	0·22
Dohne	0·00
Kubusie	0·80
Quacu	0·21
Blaney	0·00
Bolo	0·15
Fort Jackson	0·00
Prospect Farm (Komgha)	0·21
Komgha (Gaol)	0·21
Chiselhurst	0·28
East London West	0·23

X. SOUTH EAST (*continued*):

	INS.
Cata	0·60
Wolf Ridge	0·86
Dontsah	0·77
Mount Coke	0·20
Blackwoods	0·71
Albert Vale (near Bedford) ...	0·09
Izileni (King Wms. Town) ...	0·30

XI. NORTH-EAST:

Venterstad	0·00
Mooifontein	0·00
Burghersdorp (Gaol)	0·00
Cyphergat	0·00
Broughton (Molteno)	0·00
Thibet Park	0.40
Sterkstroom (Station)	0·00
Rocklands	0·10
Aliwal North (Gaol)	0·03
Carnarvon Farm	0·16
Jamestown	0·00
Whittlesea	0·00
Queenstown (Gaol)	0·00
Rietfontein (Aliwal North) ..	0·19
Dordrecht	0·00
Lady Grey	0·45
Lauriston	0·00
Lady Frere	0·14
Contest (Near Bolotwa)	0·21
Keilands	0·00
Barkly East	0·14
Hughenden	0·00
Indwe (Collieries)... ...	0·22
Hopewell (Imvani)	0·10
Clifton (Sterkstroom)	0·08

XII. KAFFRARIA.

Slaate (Xalanga)	0·10
Cofimvaba	0·26
Tsomo	0·00
N'qamakwe	0·28
Main	0·08
Engcobo	0·09
Butterworth	0·21
Kentani	0·11
Maclear	0·10
Idutywa	0·00
Baseva	0·40

XII. KAFFRARIA (*contd.*)

	INS.
Willowvale	0·07
Mount Fletcher	0·00
Somerville (Tsolo)	0·05
Elliotdale	0·05
Umtata	0·23
Qwebe	0·00
Tabankulu	0·05
Kokstad	0·13
Do., The Willows	0·08
Seteba	0·00
Flagstaff	0·09
Insikeni	0·21
Port St. John's	0·33
Umzimkulu	0·15
Maclear (Station)...	0·14
Tabankulu (Atkins)	
Umzimkulu (Strachan)	0·18
Tent Kop (Elands Height) ...	0·19
Elton Grange (Mount Currie) ...	0·09

XIII. BASUTOLAND:

Mafeteng	0·03
Mohalies Hock	0·10
Maseru	0·00
Teyateyaneng, Berea	0·18
Moyeni Quthing	0·20
Qacha's Nek	0·24

XIV. NATAL:

Durban, Observatory	0·11

XV. BECHUANALAND:

Taungs	0·04
Vryburg	0·44
Setlagoli	1·20
Kuruman	0·00
Nottinghame (Mafeking) ...	1·40
Armadillo Creek	0·07
Mochudi	0·51
Lusikisiki	0·06

XVI. RHODESIA:

Hopefountain	0·00
Rhodes Matoppo Park	0·00

CURRENT MARKET RATES (WHOLESALE) OF AGRICULTURAL PRODUCE.

The following Table of Current Market Rates (Wholesale) of Agricultural Produce on Saturday, the 18th September, 1909, ruling at the several centres named, is published for general information.

Centre	A. Wheat per 100 lbs. £ s. d.	B. Wheat Flour per 100 lbs. £ s. d.	C. Boer Meal per 100 lbs. £ s. d.	D. Mealies per 100 lbs. £ s. d.	E. Mealie Meal per 100 lbs. £ s. d.	F. Barley per 100 lbs. £ s. d.	G. Oats per 100 lbs. £ s. d.	H. Oat-hay per 100 lbs. £ s. d.
Aliwal North ..	0 12 6	1 1 6	0 13 9	0 5 6	0 7 6	0 8 6	0 10 0	0 6 0
Beaufort West	0 15 0	0 18 0	0 14 3	0 6 3	0 8 0	0 9 4	0 6 4	0 6 0
Burghersdorp	0 13 6	0 18 6	0 16 3	0 6 0	0 7 9	0 6 3	0 10 0	0 6 6
Cape Town ..	..	.	..	..	..	0 7 0	0 5 4	0 4 6
Clanwilliam ..	0 13 0	.	0 14 0	0 7 0		.	0 6 6	0 5 0
Colesberg ..	0 11 8	.	..	0 6 6	..	0 8 0	..	0 6 6
Cradock ..	0 14 0	..	0 15 0	0 6 6	..	0 6 6	0 8 0	0 6 0
Dordrecht ..	0 11 6	0 19 0	0 16 6	0 6 3	0 8 3	0 6 0	0 9 0	0 5 6
East London ..	0 9 9	0 18 0	0 15 3	0 5 9	0 7 0	0 6 6	0 7 0	0 5 6
Graaff-Reinet	0 13 9	..		0 6 0	..		..	0 8 0
Grahamstown	0 10 7	..	..	0 6 4		0 6 3	0 6 6	0 4 [illegible]
Kimberley ..	0 12 3	0 17 3	0 15 6	0 4 0	0 6 9	0 7 4	0 6 11	0 5 7
King William's Town ..	0 10 0	0 18 0	0 15 0	0 5 9	0 6 6	0 6 0	0 7 6	0 4 9
Malmesbury ..	0 10 0	0 14 0	0 12 9	0 8 0		0 6 0	0 4 0	0 3 6
Mossel Bay ..	0 13 0	0 18 6	0 16 0	0 8 0	..	0 6 0	..	0 4 0
Port Alfred ..	0 13 0	1 0 0	0 18 0	0 6 0	0 11 0	0 7 6	0 11 0	0 3 0
Port Elizabeth	0 11 6	..	..	0 6 3	..	0 5 9	0 6 0	0 4 9
Queenstown ..	0 17 6	0 17 0	0 14 6	0 5 6	0 8 6	0 8 3	0 8 0	0 5 6
Tarkastad ..	0 11 9	1 1 6	0 15 6	0 5 6	0 12 0	0 6 6	0 4 6	0 4 9
Vryburg ..	0 15 0	1 0 0	0 12 6	0 4 0	0 6 6	0 9 0	0 10 0	0 3 0
Worcester ..	0 11 6	0 14 0	0 12 3	0 6 6	0 7 6	0 8 0	0 7 6	0 4 9

Centre	J. Lucerne Hay per 100 lbs. £ s. d.	K. Potatoes per 100 lbs. £ s. d.	L. Tobacco (Boer Roll) per lb £ s. d.	M. Beef per lb. £ s. d.	N. Mutton per lb £ s. d.	O. Fresh Butter per lb. £ s. d.	P. Eggs per doz £ s. d.	Q. Cattle (Slaughter)	R. Sheep (Slaughter)
Aliwal North ..	0 3 0	0 10 0	0 1 0	0 0 6	0 0 5	0 1 6	0 1 0	£10	15/-
Beaufort West	0 5 0	0 14 0	0 0 8	2d to 3d	1d. to 3d	0 1 6	0 1 0	£10	13/-
Burghersdorp	..	0 9 6	0 0 6	0 0 8	0 0 4½	0 1 6	0 0 9	.	.
Cape Town ..	0 6 9	0 9 8	..	..		0 1 3	0 1 0	..	..
Clanwilliam ..	..	..	0 0 0	0 0 5	0 0 6	0 1 0	0 0 8		..
Colesberg ..	.	0 10 0		0 0 3½	0 0 4	0 1 6	0 1 3	..	..
Cradock ..	0 4 0	0 9 0	0 0 9	0 6 4	0 0 3	0 2 3	0 1 0	.	..
Dordrecht ..	0 6 0	0 12 0	0 1 0	0 0 3	0 0 4	0 2 4	0 0 7	£10	12/6
East London ..	0 6 6	0 10 0	0 1 0	0 0 3	0 0 4	0 2 3	0 0 10	£10	20/-
Graaff-Reinet	0 4 0	0 10 0		..	0 0 4	0 2 0	0 1 0	£9	12/-
Grahamstown	..	0 10 9	0 0 4	0 0 5	0 0 5	0 2 3	0 0 11½	..	..
Kimberley ..	0 5 0	0 10 0	0 0 5½	0 0 8	0 0 5	0 1 5	0 0 8	£7 15s.	11/3
King William's Town ..	0 5 0	0 11 0	0 0 4	0 0 4	0 0 4	0 2 0	0 0 10	£10 15s	18/3
Malmesbury ..	.	0 10 0	0 0 9	0 0 6	0 0 5	0 1 3	0 0 10	£10	16/-
Mossel Bay ..	.	0 10 0	0 0 4	0 0 5			0 0 7		..
Port Alfred ..	.	0 8 0	0 0 6	0 0 6	0 0 6	0 1 3	0 0 8	£13	18/-
Port Elizabeth	0 16 6	.	0 0 6	0 0 6	0 1 10	0 0 11		..	..
Queenstown ..	0 4 0	0 9 0	0 0 4	0 0 4	0 0 4	0 2 0	0 1 0		..
Tarkastad ..	0 4 3	0 9 8	0 1 0	0 0 4	0 0 4	0 1 6	0 1 0	£7	15/-
Vryburg ..	0 5 6	0 13 0	0 0 4	0 0 8	5d. to 7d.	0 1 3	0 0 9	£8 to £10	10/- to 17/-
Worcester ..	0 4 3	0 10 0	0 0 4	4d to 7d.	3½d. to 4d	0 1 3	0 0 9	£12 to £13	12/- to 16/-

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PRODUCE MARKETS.

CAPE TOWN.

The Produce Department of R. Muller, Strand Street, reports for the month of September :—

Ostrich Feathers.—The recent turn-over has not been very extensive. There exists a feeling that the coming London Auction Sales will result in prices going down. For this reason local buyers show restriction. However, feathers of really good quality keep up their prices well. Up-country buyers should certainly be very careful, and not pay excessive prices.

	£	s.	d.	£	s.	d.
Super Primes ...	19	0	0	31	5	0
First, ordinary to Super ...	11	5	0	17	10	0
Seconds	6	0	0	9	10	0
Thirds...	3	0	0	5	10	0
Femina Super ...	9	0	0	16	0	0
Do., Seconds to Firsts ...	4	10	0	11	15	0
Byocks (Fancy) ...	4	5	0	9	10	0
Long Blacks	2	15	0	7	0	0
Medium Blacks ...	1	10	0	3	10	0
Short to Medium ...	0	10	0	1	5	0
Floss	0	7	6	1	15	0
Long Drabs	2	5	0	4	10	0
Medium Drabs ...	0	15	0	1	10	0
Short to Medium ...	0	5	0	0	15	0
Floss	0	5	0	1	10	0
White Tails	1	2	6	2	2	6
Coloured Tails ...	0	12	6	2	5	0
Chicks...	0	1	0	0	2	6
Spadonas	0	10	0	3	5	0
Inferior Black and Drabs, short to long	0	0	6	1	10	0

Wool.—The quantities now being offered for Sale at Cape Town are weekly increasing, and find buyers at good prices. Consignments reached here recently from Calvinia, Piquetberg, Hermon, Malmesbury, Darling, Hopefield, the Roggeveld and from the Karoo. The following are the highest prices which were realised :—For Hermon 7½d. ; Malmesbury 8⅞d. ; Roggeveld 9½d. ; Karoo 7½d. ; Calvinia 8d. ; Darling 10⅝d. ; Hopefield 9¾d. ; Piquetberg 8¾d.

	s.	d.	s.	d.
Super long Grass Veld	0	6	0	9½
Do. Karoo ...	0	6	0	7½
Medium	0	5	0	6
Short and inferior ...	0	3	0	4½
Wool for Washing	0	4½	0	6
Snow-white Super to Extra	1	4	1	8
Do. Ordinary ...	1	2	1	5
Fleece Washed	0	0	0	10

Mohair.—The supplies have been moderate, and the Market has not undergone any change as yet, although a rise in the near future is anticipated.

	s.	d.	s.	d.
Firsts, Summer	0	9	1	1
Kids	1	6	1	9
Seconds ...	0	5½	0	9
Winter ..	0	8½	0	9½
Do. Kids..	1	0	1	2½

Hides and Skins.—The demand is excellent. Exceedingly high prices are obtainable for all Consignments of good quality. It is quite a pleasure to me to be able to say that the consignments arriving here now, mostly show that greater care than before is being bestowed upon the salting and drying of the skins and hides, and also upon avoiding bad cuts.

	s.	d.	s.	d.
Long woolled Skins ...	0	5½	0	6½
Short...	0	4	0	4½
Shorn	0	0	0	3
Bastards	0	3½	0	4
Cape Skins, each	2	2	2	8
Do., cut, each ...	0	0	1	3
Goat, heavy to light ...	0	10¾	1	2½
Sundried	0	0	0	6
Angoras	0	5	0	6
Sundried Hides	0	6½	0	7½
Salted	0	5¼	0	7
Wet...	0	3¼	0	4¼

PORT ELIZABETH

Messrs. John Daverin and Co., report for the week ending September 24 :—

Ostrich Feathers.—The Market was again fully supplied this week with the usual average assortment. Competition was very irregular, especially for average and common sorts, and prices showed a decided weakness, being generally in buyers' favour. The total quantity sold amounted to £16,772 10s 11d , and weighed 6,963 lbs. 10¾ ozs. Little or no business has been done out of hand The next London Sales open on Monday the 11th proximo when a large quantity will be offered, viz :—£250,000 value, the result of which is very uncertain.

	£	s.	d.		£	s.	d.
Primes : Extra Super			Special Prices.				
Good to Super ...	20	0	0	to	35	0	0
Whites : Firsts ...	12	0	0	„	18	0	0
Seconds ...	4	0	0	„	10	0	0
Thirds ...	1	0	0	„	4	10	0
Feminas : Super ...	10	0	0	„	20	0	0
Firsts ...	6	10	0	„	10	10	0
Seconds ...	2	10	0	„	6	0	0
Thirds ...	0	10	0	„	2	10	0
Greys ...	1	10	0	„	7	0	0
Fancy	2	10	0	„	8	0	0
Tails : White	0	10	0	„	3	0	0
Light	0	10	0	„	2	10	0
Coloured & Dark	0	0	6	„	0	15	0

	£	s.	d.		£	s.	d.
Blacks : Long ...	1	15	0	to	7	0	0
Medium ...	1	0	0	„	3	0	0
Short ...	0	4	0	„	1	0	0
Wirey ...	0	0	3	„	0	0	6
Floss ...	0	5	0	„	1	7	6
Drabs : Long... ...	0	15	0	„	3	15	6
Medium ...	0	10	0	„	1	10	0
Short... ...	0	1	6	„	0	7	6
Wirey ...	0	0	3	„	0	0	6
Floss... ...	0	5	0	„	1	10	0
Spadonas : Light ...	0	5	0	„	5	0	0
Dark ...	0	2	6	„	2	0	0
Chicks...	0	0	6	„	0	15	0

The following may be quoted as the approximate current values of unsorted parcels, per line —

	Whites.	Feminas.
Superior pluckings	£8 0 0 to £10 0 0	£5 10 0 to £7 10 0
Good Average lots	6 10 0 to 7 10 0	4 10 0 to 5 0 0
Poor Average lots	4 0 0 to 5 0 0	2 0 0 to 2 10 0
Common lots, stalky, narrow and discoloured	2 0 0 to 3 10 0	0 15 0 to 1 15 0

	Tails.	Blacks.	Drabs.	Spadonas.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Good	15 0 to 17 6	20 0 to 40 0	12 6 to 15 0	30 0 to 40 0
Average	10 0 to 12 6	12 6 to 17 6	7 6 to 10 0	10 0 to 22 6
Poor	3 6 to 6 6	7 6 to 10 0	5 0 to 7 6	2 6 to 7 6

It will be understood that for Special Lots, these quotations may be exceeded.

Wool.—The London Sales opened on Tuesday last, our cable reporting prices 5 per cent. higher. This news is rather disappointing although it has not effected our market up to the present, except for short, wasty grease which is decidedly weaker. A fair amount of business has been done in the open market. On the Catalogue Sale on Wednesday 1,439 bales were offered, of which 761 bales were disposed of ; good long wools sold well, but short and wasty parcels were neglected and prices lower. On the Public Market yesterday a limited quantity was offered, prices showing no change.

Snowwhite, Extra Superior ...	18d to 19d
Do. Superior	17d „ 17½d
Do. Good to Superior...	16d „ 16½d
Do. Inferior Faulty ...	13d „ 14d
Grease, Super Long, well-conditioned, Grassveldt grown (special clips) ...	9d „ 10d
Do. do. do. ...	8d „ 8¾d
Do. do. Karoo grown (special clips)	8½d „ 8¾d
Do. do. do. ...	7½d 7¾d
Do. do. Mixed Veldt...	7½d „ 8d
Do. Light, faultless, medium Grassveldt grown ...	7d „ 7¾d
Do. do. Karoo grown	7¼d „ 8d
Do. do. short, do.	6½d .. 7d

Grease, Coarse and Coloured ...	3d to 4½d
Scoured do. do. ...	2d „ 9d
Basuto Grease, short	6½d „ 7d
O.R.C. Grassveldt Grease, long & well-conditioned (special clips)	7½d „ 8½d
Do. do. do. ...	7d „ 7½d
Do. do. medium grown, light, with little fault	6½d „ 7d
Do. do. short, faulty & wasty	5½d „ 6d
Do. do. Karoo grown, long & well-conditioned ...	7d „ 7½d
Do. do. medium grown, light with little fault ...	6½d „ 7d
Do. do, short, faulty and wasty...	5d „ 6d

Mohair.—This market remains strong, but the volume of business done in the open Market during the week has been limited, our sales of 105 bales Summer Firsts and 120 bales Winter and Mixed parcels, being the most important. On the Public Market on Tuesday a fair quantity was offered. Competition was rather more active, and prices ruled in sellers' favour.

Super Kids	21d to 22d	**Mixed O.R.C. Hair (average)**	8½d to 10d
Ordinary Kids and Stained	15d „ 18d	**Do. very mixed**	7d „ 8d
Superior Firsts, special clips	12d „ 12¼d	**Seconds and Grey ...**	5d „ 7½d
Ordinary Firsts... ...	11½d „ 12d	**Thirds .. ..**	4½d „ 4¾d
Short Firsts and Stained	10d „ 10½d	**Winter Kids, special clips**	15d „ 15d
Superfine Long Blue O.R.C. Hair	10d „ 12d	**Do. good ordinary**	13d „ 14d
		Winter Hair	9½d „
		Basuto Hair .	8½d „

Skins have again improved Sheepskins in bundles, 6d.; Pelts, 4¾d.; Capes, 27d. each; Goatskins, 13d; damaged, 7d. per lb.; and Heavy Goatskins, 8½d.; Angoras, 7½d.; Shorn, 5½d.; damaged, 3½d per lb; Johannesburg Sheep, 5d.; Goat, 9d.; Angoras, 6d; Springbok, 8½d. each.

Hides.—Sundried, 8¾d.; damaged, 7¾d.; Salted, 7¾d.; damaged, 6¾d.; Thirds, 3d.

Horns.—3½d. each all round.

EAST LONDON

Messrs. Malcomess & Co., report for the month of September :—

Wool.—During the month of September the Wool markets throughout the World have been shewing an improved tendency, culminating in an advance of 7½ per cent. for Grease in Antwerp Public Sales held on 15th inst.; 7½ per cent. for Grease in London Public Sales held on 21st inst.; and 5 per cent for Scoureds.

This firm tone and tendency is almost entirely due to the scarcity of present available supply It is expected that values will decline when the new season's Wools now being shipped reach the manufacturing centres in larger quantities.

Locally there was a very keen demand, and extreme prices were paid for the first arrivals of new Wools, which, though faulty were dry, and promised to yield well; but now that Wools are coming in more freely and are sampling out much heavier buyers are not so keen and the tendency is easier.

The bulk of the Wools shorn are of good length but are more or less faulty and seedy, which is not enhancing the value.

We have sold pretty freely during the past month but the stocks in our market are now accumulating because Up-country buyers have paid too much above Coast values, and, in most instances, will have to face a loss if they sell at to-day's rates.

In view of the high values now ruling and the huge supply likely to be available within the next three months, we think they ought to cut their loss now, as we can see nothing to be gained by holding.

It is always forgotten that the rise of 7½ per cent. is on July Sales, which dropped fully 5 per cent. against May Sales, so that the theoretical rise against last season at this time of scarcity is really only 2½ per cent. In fact many Wools bought last season are selling now in London at a small loss, or at bare cost.

We quote as follows :—

7d to 7½d	**for very lightest and best Transkei and K.W.T. local Native Wools.**
6½d „ 7d	**for average genuine ditto.**
6d to 6½d	**for average Native Grease.**
6d „ 7d	**for average Basuto Native Grease, average to extra light descriptions.**
Grease—Super long light Kaffrarian Farmers and similar well-conditioned Wools (special clips)	9d to 10d
Super short ditto (special clips)	7½d „ 8½d

Super long Light Skirted Farmers	7¾d to 8¾d	
Super short ditto	6½d „ 7d	
Good long well-conditioned Grass Veldt	6d	7½d
Good short ditto, free from fault	6d	6¾d
Short, faulty and wasty...	5d	6d
Long Fatty Grease, faulty ...	4½d	5½d
Short ditto ditto	4d	5d
Coarse and Coloured Grease ...	3d	4½d

Mohair has been firm with a fair demand for Long Blue Mohair, and the bluish Basuto East Griqualand Native types. We have sold the former at 12½d., and the latter at 9½d. for the very inferior, to 10d. for the slightly better grades.

We quote as follows :-

12d to 12½d	**for superior long Blue Mohair, free from kemp.**
10½d „ 11d	**for average ditto.**
9½d „ 10d	**for sorted Basuto Hair.**
9d „ 9½d	**for average ditto.**
5d to 6d	**for Seconds.**
3½d „ 5d	**for Dockings and Grey.**
9d	**for good average Winterhair.**
13d „ 14d	**for genuine Super Winter Kids.**

Sundry Produce **has realised the following :—*Hides*, Sundried, 8¾d.; Dry-salted, 7¾d. *Goatskins*, 12¾d.; Angoras, 8d.; Damages, 6d. each. *Sheepskins*, 6d.; *Pelts and Capes*, 4¾d.; *Transkei and K.W.T. parcels*, 4¾d. *Horns*, 2d. to 4d. each, according to size and quality.**

BREEDERS' DIRECTORY & FARMING NOTICES.

Advertisements under this heading are inserted at the rate of 30 words for 2s. 6d., (minimum charge) per insertion, and 6d. per line of approximately six words above that number. Payment must accompany Order. Cheques and P.O.O. to be made payable to the CENTRAL NEWS AGENCY 125-127, Long Street, Cape Town, to whom all communications should be addressed.

OSTRICHES.

SPECIALS ONLY.—Choice pairs, £50 to £100 per pair.—F. W. BAKER, Laughing Waters, Willowmore.

OSTRICHES. — Young and old.—For further particulars, apply to Mr. R. S DE VILLIERS, The Imperial Cold Storage and Supply Co., Ltd., Porterville Road.

PIGS.

BERKSHIRE BOARS.—Pure bred. Ages two to fifteen months. Bred by Charles Leonard, Esq on his well known "Gloria" Estate —For further particulars, apply to Mr. R S. DE VILLIERS, The Imperial Cold Storage and Supply Co, Ltd, Porterville Road.

PURE BRED BERKSHIRE PIGS.—Prize Winning Stock. Boars and Sows, £3 each. Also Buff Orpington and White Leghorn Poultry. —Apply MANAGER, Maitland River Farm, Green Bushes Hotel. Port Elizabeth

CATTLE.

FRIESLAND BULLS, bred from the best IMPORTED stock, from a few weeks to fifteen months old —For further particulars, apply to Mr. R. S. DE VILLIERS, The Imperial Cold Storage and Supply Co. Ltd., Porterville Road.

ENGLISH BREEDERS.- WILLIAM COOPER AND NEPHEWS, "Cooper Dip" Works Berkhamsted, England' Shorthorn, Hereford and Polled Cattle; Shropshire Sheep; Berkshire and Large Black Pigs, 64 First Prizes at British Shows last year. Every facility given to Colonial Buyers. Send to W C & N P.O Box 305, East London, Cape Colony, for "Pedigree Stock and its Export," gratis and post free

GENERAL.

PASPALUM GRASS PLANTS.—Strong roots per Rail or smaller plants per Post to any address. See larger advertisement, page ix. this Journal.—A. C. BULLER, Dwarsriviers Hoek, Stellenbosch.

LUCERNE AND ALL FARMER'S SEEDS

Samples and Prices on application.

D MULLER & CO., Seedsmen,
Hamburg, Germany

THE POULTRY YARD.

WHITE LEGHORNS.—From two of the Best American Strains. Eggs, 3/6 per dozen. Packed and delivered F O R Correspondence invited — C. R. PLUMBLY." The Gums Porterville Road, C.C

BUFF ORPINGTONS, SILVER WYANDOTTES BLACK MINORCAS, Winners of over 90 prizes. Bred for Utility and Show points. PULLETS from 10/-, also COCKERELS from 7/6. Will improve the table and laying qualities of common fowls. Mrs. R. F DOTT Kenilworth, Kimberley.

R. W. HAZELL, Trege[illegible] Road, Rondebosch, Breeder of H[illegible], Exhibition and Utility White Wyandottes, Black Orpingtons and Houdans. Wyandottes a speciality Eggs and Stock for Sale Inspection and correspondence invited Many testimonials from pleased customers

WHITE LEGHORNS.—Best American Utility Strains. Settings of Eggs for sale, from pure bred utility White Leghorns, F.O.R., 10/6 per setting of 15. Cockerels, 10/- to 20/-. Terms, cash with order. Mrs. W. L. STEEL Stellenbosch.

BUFF ORPINGTONS. — THE FARMER'S FOWL. The fowl that LAYS WHEN EGGS ARE TOP PRICE. A 1 TABLE BIRDS. My Buffs have unlimited orchard and grass run, and are noted for hardiness and good laying qualities. Young stock always for sale at very reasonable prices Ask for inclusive quotations; carriage paid to any station in South Africa and AT MY RISK to rail destination. My list of prizes won at shows all over South Africa will convince you that this unrivalled *Colonial* strain of 10 years' standing CAN HOLD ITS OWN AGAINST IMPORTED STOCK. Buy hardy Colonial-bred birds and save your pocket. Address: A. C. BULLER, Dwarsriviershoek, Stellenbosch.

DOGS

IRISH TERRIER PUPS —Good Jackhal and Vermin destroyers, also splendid watch dogs cheap.—C. R PLUMBLY, "The Gums," Porterville Road, C C

Agricultural Journal

OF THE CAPE OF GOOD HOPE.

No. 5. NOVEMBER, 1909. VOL. XXXV.

Published Monthly in English and Dutch by the Department of Agriculture and distributed gratis to bona fide farmers in the Cape Colony on application through the Resident Magistrate of the District.

SUBSCRIPTION 5s. PER ANNUM. Post Free in South Africa.
Remittances to be made Payable to the Publishers CAPE TIMES, LTD., Church St., Cape Town.

Postal Address:
The Editor "Agricultural Journal," Department of Agriculture, Cape Town.
Telegraphic Address: "Bulletin," Cape Town.

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NOTES.

Rhodesian Plant Import Regulations.

The Department of Agriculture has received an official intimation from the Rhodesian Authorities to the effect that it has been observed that consignments of plants which, under the Intercolonial Regulations, should be accompanied by Plant Regulation Forms A and B, are commonly received at the examining centres in Rhodesia unaccompanied thereby, and that instructions have been issued to the Examining Officers that such consignments are to be rejected in future

More Veterinary Surgeons.

Two additional veterinary surgeons are to be attached to the Government staff so soon as suitable candidates can be selected These additions have been necessitated to meet the pressing needs forced upon the Colony by the advance of East Coast Fever towards our Eastern borders. All the available veterinary officers that can be spared are now engaged in the onerous task of attempting to keep that disease from invading our borders, and this has left a shortage of technical assistance for the general work of dealing with animal diseases in other parts. This, however, will be partly remedied when the additional veterinary surgeons arrive to take up their duties.

Tabloid Refrigerators.

Mr. J. F. Pentz, of Progress Farm, Vryburg, called the attention of the Department some little while back to a process of preserving meat, vegetables, etc., by pastilles. He sought information, and on enquiries being instituted through the Trades Commissioner in London, a short report was procured from Mr. Loudon M. Douglas on the subject. Mr. Douglas states that the so-called "Tabloid Refrigerating Agent" has no refrigerating effect at all. The tabloids are simply a composition of Formic-Aldehyde, a well-known preservative, the evaporation of which in a close space undoubtedly sterilises the atmosphere for the time being. The application of the principle to meat has formed the subject of one or two patents, but these have not been successes. It is not considered safe to use this drug in milk as the chemical action on the casein renders it insoluble. It is, however, a wonderful disinfectant.

Ostrich Capons.

Mr. P. D de Villiers, of Beaufort West, writes to say that since the first four ostriches were caponised on his farm by Mr. Elley, of the Veterinary Branch of this Department, he has had 300 more operated upon, out of which only seven have died. The operation is now performed by them without chloroform, and he states that one man can caponise 25

birds a day with ease. The hen bird's feathers improve wonderfully after castration. A short time ago he had 100 birds plucked, of which there were more hens than cocks. A local buyer, on seeing them, remarked that threequarters of the feathers were from male birds and only one quarter from females. An agent in Port Elizabeth to whom the feathers were sent made the same remark. Mr. De Villiers received a very good price for the whole plucking. He now, he says, intends keeping these birds for plucking purposes till they die, and has started breeding from a better class of birds from Oudtshoorn.

How to Make a Handy Roller.

The details of how to make a roller for hand use about the homestead, according to the illustration herewith, are: Get a piece of 2-ft. earthenware piping, about 14 in. in diameter, and set it on a board, as shown. Place an iron rod exactly in the centre, passing down through the board about an inch, and projecting above the tiling about the same distance—that is 2 in. Now fill in the tiling to the top with cement and broken

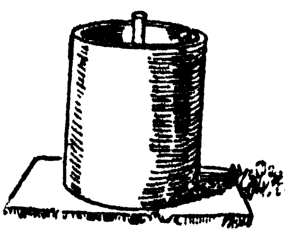


Fig 1.

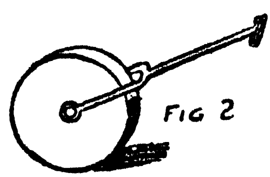


Fig 2

rocks, the cement being two parts sand to one of dry cement Have the ends faced with a clear mixture of sand and cement, that is with none of the broken rock appearing in view. Now, arrange a handle upon the projecting iron bar in the centre, as shown in Fig. 2, and the roller is complete. Should the outer covering of tiling ever become broken by accident there will still be left a firm roller of cement that has hardened to rock-like consistency.

East London Cotton.

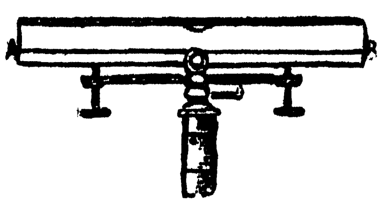
While in East London recently, Mr. R. W. Thornton, the Government Agriculturist, took a sample of cotton from Messrs. Dunn & Co.'s store which had been grown by General Sir E. Y. Brabant, in the East London district. He forwarded this sample to Mr. A. Niven White, the Cotton Expert of the Transvaal Government, for report. That gentleman reported as under:—"The cotton is superior in every respect to anything I have handled since I arrived in South Africa. It is remarkably clean and silky, soft to the feel, very lustrous, and practically free from stain. . . . The staple is very regular—which is an important point. It is fully 1⅝ inches long, and is finer and stronger than Upland cotton. The variety is Sea Island cotton. Sea Island cotton is more difficult to produce than Upland cotton, and is more exacting in regard to soil and climate. It yields less per acre (100 to 250 lbs.) and costs more to pick and gin. It is used in making fine threads for sewing and for laces, fine yarns for fancy hosiery, and for weaving into the finest lawns and dimities. I should think it is worth about 1s. 2d. per pound."

The Cotton Industry—An Excellent Offer.

Messrs. S. A. Nathanson-Commandite, of Durban, Natal (P.O. Box 261), write to the Department stating that they have been appointed sole agents in South Africa for the Cotton Central Office (Caravonica Cotton seed). This cotton seed they state is of the best, and the cotton grown from it of the finest quality so far known, while higher prices are paid for it than any other in the market. This firm, as representatives, bind themselves to buy such cotton, or if preferred to sell for the grower in Europe, in any quantity, and eventually at a fixed price for years to come. They offer to go further than this and supply the Caravonica Cotton seed free of charge in any quantities f.o.r. Durban on the following conditions: (1) Intending growers must make application to them for the seed, stating situation and size of farm. (2) Growers to obey their instructions *re* cultivating this cotton, and allow them to inspect the cultivated ground at any time they may wish. They (Messrs. Commandite), as representatives, to receive five per cent. of the crop either in cash or in cotton at option of growers. They ask us to make this advantageous offer known, which we do willingly as it would be a splendid thing for South Africa if we could get this industry thoroughly established and could grow this commodity on a large scale. The above offer is open to any farmer, but we must ask all to communicate direct with the firm abovementioned.

Land Grading Level.

This is a handy level of sufficient accuracy for the ordinary work on the farm or station connected with grading for irrigation, tank sinking, road grading, or ditch making. "It is obtained," *The New South Wales Agricultural Gazette* writes, "at a cost of 15/- to 20/-, somewhat similar to the illustration; mounted, at a convenient height, on a stake driven into the ground. It will be found very handy, as sights of 2½ to 3 chains can be made with sufficient accuracy for this class of work. A light staff 10 ft. long, of 3-in. x 1-in. batten, with a scale of feet and inches painted on its face in black on a white ground, is required with such an instrument, and a bagful of pegs to mark the levels."



Locust Destruction.

The work of Locust Destruction initiated by the Department is meeting with great success. The army of destroyers is growing, and the activity shown by the farmers as a whole in this work is very gratifying. At one time the locust poison, which is distributed free by Magistrates and also by Police Stations could hardly be forwarded fast enough, so great was the demand. Unfortunately there are in every district some who refuse to assist in the destruction, and while in some cases their reluctance has been overcome by practical demonstrations by the Locust Officers and by persuasion on the part of these gentlemen, it has frequently become necessary to call in the aid of higher powers to deal with such obduracy. The action of this class of farmer is greatly to be deplored, as their negligence is a present danger to their neighbours, and a future danger to the whole country. The destruction of a considerable number of swarms is reported weekly, and at the end of the season a return will be published showing the beneficial results which have attended the work.

Locust Destruction with Arsenate of Lead and Cooper's Dip.

"W N.G," writing from Achter Sneeuwberg, on the 11th ult., to the Government Entomologist, reported the appearance of voetganger locusts in that part of the Cradock district, also that he had just succeeded in destroying a very large swarm which came on to his farm from Doorn River, travelling north-west He had no Government poison, but fortunately had some arsenate of lead which he had ordered for the fruit fly. They ate up clean about fourteen bags of cut-up grass and green barley. He made the spray as follows:—

1 lb Arsenate of Lead.
3 lbs Brown Sugar.
1 packet Cooper's Dip
12 gallons water.

The result was that the locusts began to die in about twelve hours, and hardly moved forward two hundred yards On the third day he concluded it was quite unnecessary to poison any more, as there were only little lots of stragglers which had escaped the poison.

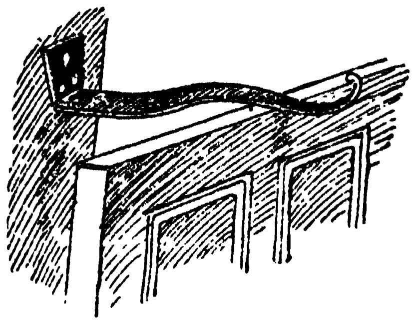
On the 17th ult the same correspondent wrote reporting further successes with arsenate of lead and Cooper's dip. He then stated: "Up to this I have destroyed eleven swarms. It gave me the greatest pleasure to see how the little brutes gobbled up the poisoned bait and regularly fought about it In no time almost every vestige of bait would disappear, and the progress of the swarm stop at once. After a few hours they would all collect in the stones in groups, and then violent purging would start, the tops of the stones glistening with the moisture exuded Next morning most of them would be dead, and the rest would die in the course of the next day or two. If I noticed some of the stragglers that had not taken poison were getting a move on, I would just sprinkle a little more poisoned grass amongst them, and that would be the end of the swarm I visited one of my neighbours' farms on Friday, and found the owner with all his family, including his wife, driving locusts with flags. Three separate swarms were in his crops, besides what they had managed to drive past. I tried hard to persuade him to use poison, but have not heard if he has done so."

The above mixture, states the Government Entomologist, contained the equivalent of 1¾ ozs. of white arsenic in *insoluble* form, and about 6½ ozs. in *soluble* form, or about a half pound in all. The weaker Government mixture, that is one part of poison to 66 parts of water, is really much stronger than this. It contains about the equivalent of threequarters of a pound of white arsenic to 12 gallons, and the arsenic is all in exceedingly poisonous soluble form. Therefore these successes help to show that the Government poison is quite strong enough. It also shows what one can do to help himself when so minded.

Locust-Proof Maize.

Sir John Graham has called our attention to the following interesting paragraph in the last annual address of the President of the Buenos Ayres Great Western Railway. The Argentine, it may be well to mention, suffers to an enormous extent from the depredations of a species of locust very closely allied to the Red Wing Locust which ravages Natal and the seaboard of the Transkei. The paragraph in question reads: "Speaking of the damage to maize from locusts, I was much interested, as I am sure you

will be, with a conversation I had with an eminent agriculturist, Mr. Henry Derbyshire, who told me that he had been experimenting with great success with a kind of maize which he called "maize amargo"—that is bitter maize—which the locusts would not eat, although it was quite suitable for all the purposes that ordinary maize is used for. I am sure we all hope that he will be successful in his experiments, and so solve the locust question as far as maize is concerned."



Automatic Door Spring.

A means of keeping stable, cowhouse, and other doors open when required is shown in the accompanying illustration, which is described as acting effectively. The steel spring is fastened to the wall, and the dots show how screws should be placed to keep the spring in position

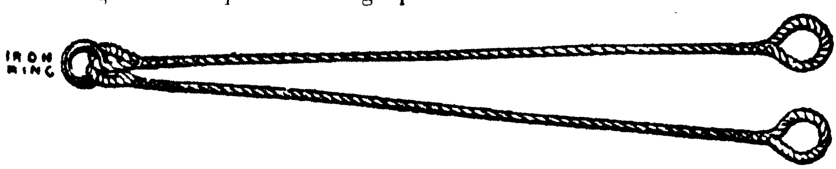
"Fertilisers and Manures."

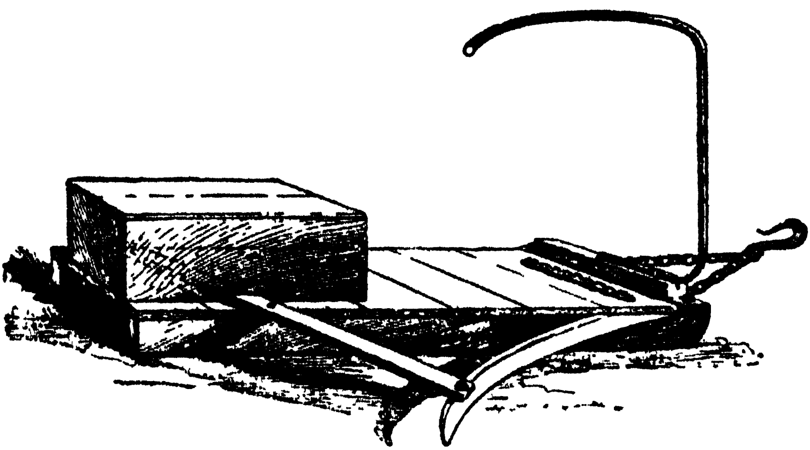
We have received from Mr. T. Maskew Miller, of Cape Town, a copy of "Fertilisers and Manures," an exceedingly valuable book written by Mr. A. D. Hall, M.A., F.R.S., the Director of the world-renowned Rothamstead Experiment Station. An intelligent use of fertilisers is a great help in every form of agriculture, and though this book is written primarily for the information of the British farmer, it is so sound and so clearly expressed that it must prove of great assistance to everyone engaged in facing the problems involved, no matter where they may be situated. Mr. Hall is known as a great authority on the subjects he handles so well in this compact volume, and when he sets out by telling his readers that his aim is to make them understand the mode of action of the different fertilisers and their relation to particular crops and soils, rather than tread in the beaten ways, it may be taken for granted that he is more than interesting. The book is meant for farmers and senior students and teachers in agricultural schools, and is frankly put out as a companion work to "The Soil" by the same author. The language is therefore kept as non-technical as possible, though some elementary knowledge of chemistry had necessarily to be assumed. Questions of manufacture and analysis are avoided, and the whole subject dealt with mainly from the point of view of those who are using or going to use fertilisers. The book is divided into thirteen chapters, and it would be difficult to say which is the more interesting. As an introduction, we have a short historical sketch showing the growth of the theory of the nutrition of plants. This naturally leads to mention of the introduction of commercial fertilisers, soil constituents, and the nature and function of a fertiliser. From this point the principal fertilising agents are dealt with at some length in all their varying aspects, until we reach a deeply interesting chapter on farmyard manure. Then we find chapters devoted to the indirect fertilisers, theories of fertiliser action, systems of manuring crops, and the valuation and purchase of fertilisers, the whole winding up with one devoted to the conduct of experiments with fertilizers. It is a book that should be in the hands of every farmer who takes an intelligent interest in his work, and we can confidently recommend it. It is not a book

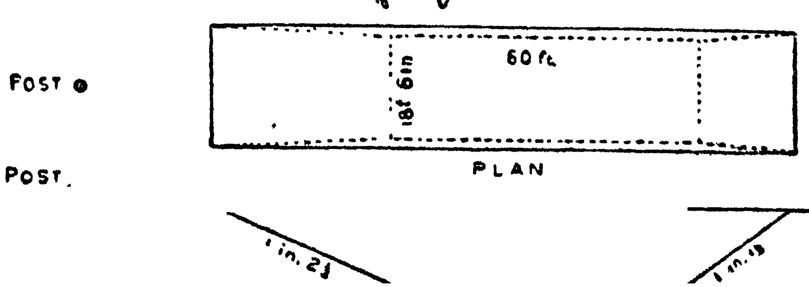
to turn to for a cut and dried prescription to meet an emergency, but one that should be studied carefully, for its value lies in the great principles expounded in lucid and comparatively simple terms Mr. T. Maskew Miller informs us he has imported a limited number, and these are now on sale.

Storing Ensilage.

The wise stockowner (says the *Pastoralists' Review*) prepares for bad seasons by storing the kind of forage which is most available. It rests with individuals as to which kind of fodder can best be grown in their particular districts Mealies and sorghum (Kafir corn) are excellent crops for making ensilage, and the accompanying illustrations are approved designs for stowing these crops in ensilage pits







It is necessary to have a quick means of cutting maize, and the illustration herewith shows a very simple device which can be made by any handy man. It consists of a sledge 3 ft. 6 in. long, 20 in. wide The runners are made of 3 x 2 or 4 x 2, and they are held together by the floor of stout boards. A scythe blade is attached to the sledge, as depicted. A steady horse should be harnessed to the sledge, which is driven between the rows of mealies. The driver sits on a box on the sledge, and driving with one hand he guides the fall of the maize stalks with the other

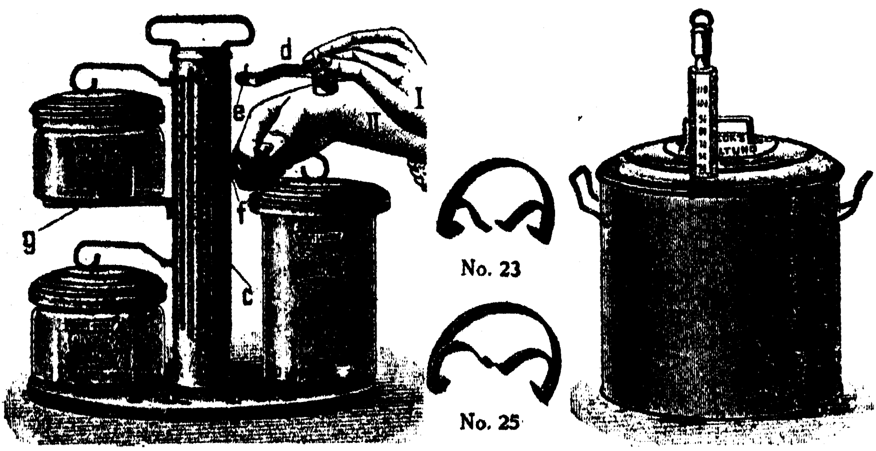
In regard to the pit itself, the design herewith, from *The New South Wales Agricultural Gazette* of 1906 is a very convenient size. It is 108 ft. long by 20 ft wide (surface measurement), 60 ft. long by 18 ft. 6 in. wide (bottom measurement), and 12 ft. deep. One end should have a grade of 1 in 2½, and the other a grade of 1 in 1½. A round post about 6 in. in diameter, and about 8 ft. long, is sunk 4 ft. in the ground about 20 ft. from the 1 in 1½ grade entrance to the pit, as per diagram. A pit of these dimensions will hold about 300 tons of ensilage. It can be constructed with a plough and scoop, and if done by the owner's plant it will cost very little.

It goes without saying that the cost of storing ensilage is reduced by every device which saves labour and time. Mealies are awkward to handle in bulk, and a quick way of unloading the drays in the pits is to make a strop or sling as follows:—Take two 16-ft. lengths of stout rope and splice a loop at each end. The other ends are spliced to one strong iron ring, as shown in the diagram. Before the dray is loaded this sling is laid on the bottom and the loops slipped over the projections or "summers" at the back of the dray. An ordinary hayframe is fitted round the dray, with the exception that no frame goes across the back, so that the load can be hauled off When the loaded drays enter the pit the iron ring end of the sling is thrown back over the load, and a long rope is hooked on to it, and one or two turns of it are taken round the joist, shown in the diagram As the dray goes down the slope the rope is paid out, so as to just take the weight off the horse in the shafts. When the dray arrives where the load is to be dropped the rope is made fast, and as the dray moves along the sling pulls the load off

Canning Vegetables in the Home.—A Method for South Africa.

Mrs E M C. Loopuyt writes:—"In the September issue of the *Agricultural Journal* there appeared an article on the sterilising of fruit and vegetables. The principle referred to in that article I can recommend in every respect through years of experience. I am, however, of opinion that the application, as described there has in many respects been improved by the system of Weck, which in this country is much too little known and yet might render good service in this Colony. Theoretically the method is to preserve vegetables just the same as the one mentioned in the American article, but in practice Weck's Sterilisator offers an arrangement, which with less trouble offers greater results. Instead of the large pan or copper, for which one has to make oneself a loose bottom, Weck provides a large tinned pan, in the cover of which there is an opening, in which a thermometer fits. The use of this thermometer gives considerable advantages. Firstly one can see to the minute when the water, in which the cans of vegetables are standing, starts boiling, and years of experience having taught for how long various kinds have to be heated in order to become sterile, it is sufficient for almost all vegetables and for all fruit, viands, etc., to be heated once only. While in the previous article it is advised to warm all cans on three successive days for an hour, it is with the Weck cans always sufficient to do it only once (except in case of large beans and peas), and that makes, of course, a very important difference in labour and decrease of fuel, with more palatableness, as many kinds of vegetables will get too soft after having been boiled thrice.

"For fruit and fruit juices the boiling point is not needed in order to sterilise them, and the flavour is better retained by heating to 70 or 80 degrees than by boiling them. The use of the thermometer renders this possible, and generally it is admitted that fruit, preserved in Weck's Sterilisator, are more delicate in flavour than others. For instance, by this method strawberries and strawberry juice may be preserved and the flavour retained, which by other methods appears to be seldom the case. Not only fruit and vegetables are sterilised in that way. The writer has preserved milk in Weck's cans for three years and found it, in using afterwards, to be of perfectly good taste.



THE WECK STERILIZER.

New Apparatus No. 18. — Bow Springs for sterilizing bottles singly. — Sterilizing Vessel No. 30.

"Indeed the whole arrangement is so excellent that it is difficult to mention anything which can not be preserved. In season one may fill the cans with sausage, liver-pie, pickled meat, roasted meat, fried kidneys, etc., various kinds of soup, roasted fowl, fried fish, crawfish and curry. For all these the same simple method exists which any housewife can apply. The Weck's cans are cleaned, then filled with the previously prepared victuals to just below the brim, the rubber rings put on the brim and the glass cover put loosely on it. Now the glasses are put in apparatus no. 18, where they are jammed by spring "f" so as to stand firmly and closed, or else one uses the springs no. 23 and no. 25 and puts the cans loosely in the large pan, no. 30, fills it with water, by preference so that the cans are submerged, and heats. Almost everything, fruit excepted, is kept boiling for an hour or more, coolled down and taken from the water. When the cans are quite cool, the springs are removed, and if the process has been successful, the can remains closed, because a vacuum has been formed and the atmospheric pressure outside the can keeps the cover firmly closed.

"And here there is another advantage of Weck's cans above those which are kept closed by means of screws or clasps. It will happen that, owing to one or another trifle (a small crack in the can or a shifting of the ring) the can is not hermetically closed, or, that, after insufficient sterilising, fermentation starts and thus gases develop in the can, which

suspend the vacuum. In case of other cans it is not discovered until one notices that the contents of the can have spoiled Weck's can, however, shows at once a loose lying cover, and one can heat it once more or use the contents before it is spoiled, so that nothing gets lost

"For five or six years Weck's Sterilisators have been obtainable in this country—and up till the present time not twenty of them are in use, a fact which certainly affords no proof of great interest The cause of it must be then unfamiliarity and a certain fear of novel, little understood things. At the shows at Stellenbosch, Paarl and Rosebank, where the sterilisator and the cans were on view, many, especially the gentlemen, showed much interest, but the ladies were often afraid of novelties and of more work, and presumably knew also too little of the theory of any preserving method to be able to appreciate this method. True it is new work, but work that is worth the trouble. Whenever more knowledge of trophology will make our women and girls recognise the great value of vegetables for the health, they will be proud to preserve during the few months of fresh vegetables a large supply for the dry season, and they will find time to do this work as well as for the making of "confijt" and other luxuries. There is another reason why sterilising should be recommended. The certainty that *all* vegetables will be able to be used, either immediately for the table, or later on from the cans, gives the housewife a new interest in the kitchen-garden. Every one knows how unpleasant it is to have all peas ripe together, and not to be able to use them all. Well, the housewife, who has Weck's Sterilisator ready, delights in every row of beans, in every bed of carrots, tomatoes, etc. And in a country like this, where life on a farm has not always for young women the attractiveness of life in town, anything may be called of importance that gives a new interest in house and garden to the educated woman And that is performed by Weck's arrangement Witness the place it has taken in Germany, Holland and other countries and the enthusiasm, with which the one recommends it to the other. For about a year and a half I have been trying to make this method known here. Shortly, I hope, various schools for cookery, which have a Weck's Sterilisator, will co-operate in bringing it to the knowledge of others.

"At the next Rosebank show 3 special prizes will be available exclusively for those vegetables and fruits which have been preserved according to the system of Weck, and perhaps it will be an encouragement for some in order to show what they are able to do, and for others a reason to get to know this method. No one need be afraid to try the work. It is simple and interesting so that it is a pleasure to do it; and even greater pleasure to see how the members of the family relish the contents of the cans."

Kafir Corn on the London Market.

The S.A. National Union has been making enquiries as the probabilities of the successfully introducing Kafir corn on the London market. The chairman of the London Corn Exchange writes, that after making full enquiries he finds that the demand is a limited one and that it would be very difficult indeed to sell a very large quantity at any price; secondly, that the demand for the white and black qualities is quite nominal, there being scarcely any market for it in London. The red goes into consumption

in moderate quantities and is worth 23s. per 480 lbs. landed and bulked in London. There is very little market for it c.i.f. as the demand being retail it must be landed, and this demand is not expected to greatly increase at any rate for some time unless the price was lowered considerably below the value of other grain. He thinks there is more enquiry on the Continent for this article than there is in England.

Bees :—Workers and Queens from Eggs laid by Workers.

Mr. G. W. Onions, P.O Retreat, Cape District, has deposited with the Government Entomologist an account of observations and experiments conducted by himself, which tend to show that laying workers of the native black honey bee are far more common than is generally supposed, and that their eggs generally produce workers and not infrequently queens Mr. Onions is a keen bee enthusiast who is well acquainted with the standard British and American publications on bees, and he believes that he has fully substantiated his astonishing statements. The phenomenon has been suspected by him for several years., He does not suggest that it is true of the Italian or any other exotic variety of bee,—his observations in this connection being confined entirely to the African bee although he breeds others. He proposes to make the details of his chief observations and experience public at a later date.

Dried Locusts.

Several correspondents in coastal districts have written lately to the Department to inquire for the names and addresses of those who may have dried locusts for sale. If any one has supplies to offer, he is invited to write to the Government Entomologist, Department of Agriculture, Cape Town, stating the quantity on hand and the terms of sale.

In connection with the above subject a Cape Peninsula Poultryman writes: "In saving the Brown Locust in quantities (which he considers the most suitable for his purposes) after they are dead they should be strewn out in the sun to thoroughly dry off, otherwise when bagged up for market (old grain bags) they will heat and hatch out countless maggots, besides making an unendurable smell. The smell is present even when dry, but not very noticeable. For feeding fowls use rather more than you would of dried beef scraps, and mix in with the morning bran mash feed. I had two lots from the Agricultural Department through Mr. Du Toit in May and August of 1907, about 500 lbs. each time. Mr. Breda, of Clontarf, Plumstead, and Mr. Dixon (Premier Gate Co) Hout Street, also had some on my recommendation. After that the Department could not supply, and they then recommended me to the Griqualand West Farmers Society, but their members would not bother to bag them up—Kimberley is the headquarters. I then wrote to Marshall Brothers, Bamboo Junction near Queenstown, who had had swarms on their farms (November 1907) and succeeded in getting a few bags. These proved much cleaner and better preserved. Mr. Dixon and I had 16 bags between us, about 800 lbs., for which we paid, I think, £3 plus railage (Colonial produce rate). Since then I have not been able to get any and I would gladly take 1,000 lbs. to-day. It comes cheaper than American meat, is an ideal composition for fowls and moreover, is Colonial.' I am not sure but I have heard that the arsenical poisoning of swarms does not prevent the dried poisoned locust from being fed to fowls, but I have had no opportunity of testing this."

Phalaris Commutata.—Toowoomba Canary Grass.

The controversy of opinions regarding the name of this excellent fodder grass has at last been settled by Mr. Otto Stapf of the Royal Gardens, Kew, England. He states, in the last issue of the *Kew Bulletin*, that there is no occasion for treating it as a new species, as it appears to be simply a very robust form of the Mediterranean *Phalaris bulbosa L.* It is not quite clear how it came by the name of *P. commutata*, but the name "Toowoomba Canary Grass" has arisen in consequence of its having been originally distributed by the Curator of the Toowoomba Botanic Gardens, Queensland. In all the Australian Colonies, this grass has acquired the reputation of being an excellent drought-resisting winter grass, and on this account was introduced into Natal and Cape Colony in 1907, with promising results. In ordering seed, it will be as well to order it by its botanical name, thus: *Phalaris bulbosa L.—P. commutata*.

Notes on Fraserburg.

Mr. A. B. Rowan, C.C. and R.M., writes:—Fraserburg is par excellence a sheep grazing district, and in its present state can be looked upon as one of the best in the Colony—if not the best. Diseases amongst small stock, with the exception of the ever present scab, are very few. Man and beast thrive well here. Doctors don't, as the climate is too good and the proprietary article too much sought after. Only we are too far removed from civilization. Other forms of farming enterprise for the present are impossible owing to bad communication and great distance from markets. It is very encouraging to notice that ostrich farming is again being taken up. Next to Oudtshoorn there is no other district so well suited for this class of farming. The birds like the scrub, and lucerne can be grown anywhere with ease. With a proper system of canal inundation on the Zak and big dams across the many loops Fraserburg is bound to go ahead by leaps and bounds—but we are going already. Good merino rams and ostriches have been recently introduced and we are expecting good results. To me this is an unknown and undeveloped district, and a good district too, and good enterprising men squeezed out or in search of land will get all they want here.

Judges' Association for Cape Colony,

Mr. C. G. Lee writes with reference to the decision arrived at by the recent Agricultural Union Congress that the committee then appointed, having accepted the responsibility, their work is bound to bring a hopeful spirit, mainly because the country is quite ready for the movement, and has said so. In this all the old judges are in accord, notwithstanding that they recognise the change that must result seeing that an association means co-operation among judges, and co-operation, as all know, cannot be carried on successfully without rules and regulations, which will take the place of the old way of "go as you please." The committee from the first decided that every recognised judge shall have a fair opportunity of stating his views as to how the association should be worked, and the vote of the majority will decide. Under such conditions it is firmly believed everyone who does not get exactly all he wants will, notwithstanding, co-operate by sinking minor differences, and accept a position that may seem a little strange at first. At the same time the committee's object is to disturb the existing state of things as little as possible, but rather to graft on to the old, and so amplify it to meet the requirements of the times.

The discussion at the Cape Union meetings revealed a readiness on the part of many recognised judges and exhibitors to keep pace with the times, so there need be no fear of the Cape getting behind in the matter of up-to-date methods of judging at shows: further, there is an unqualified willingness to work in conjunction with the other colonies as soon as the association is formed, to meet the suggestions of the recent Inter-Colonial Conference for amalgamating, thereby assuring a uniform system of judging throughout South Africa, besides providing for an interchange of judges between one province and another. It is hoped that the societies will not feel disappointed if they do not get all they want in the matter of judges at the very outset. Of course, it is admitted the needs are urgent, because in most sections, through better classification, and other improvements, exhibits are year by year becoming more equal, correspondingly increasing the requests for a greater number of qualified judges. The formation and operation of a judges' association is bound to increase the number of qualified judges, though not so rapidly as some seem to anticipate. And it appears wiser for the societies to make their selection of judges as heretofore to meet the requirements of the coming show season. The committee realise the need for prompt action; at the same time new ground has to be broken, and it is better to go a little slow than to make a false start

Mr. Lee adds that arrangements have been made to conduct practical judging demonstrations, something on the plan of the recent demonstrations conducted by the Free State Judges' Association, some societies having already agreed to provide the necessary accommodation for such demonstrations, which will be most interesting, besides very instructive, especially to younger farmers and others, who in the near future may take up judging. The committee, it is anticipated, will arrange for lectures on judging where demonstrations are not practical, all done with a view of establishing a judges' association on the surest basis.

BECHUANALAND FROM THE IRRIGATION STANDPOINT.

A RECONNAISSANCE SURVEY.

By F E KANTHACK, A M I C E., Director of Irrigation

(Continued from page 122)

COMMUNICATIONS

(43). Bechuanaland has one line of railway running along its extreme eastern margin but the rest of the country is very badly served by means of communication It is for the most part either sandy and very heavy or else exceedingly rough owing to the protruding lumps of dolomite An

Typical Bechuanaland Veld

ox-waggon journey across this dolomite veld wants to be experienced before it can be realized.

A few well macadamized roads are very badly wanted. One from Vryburg to Morokwen and another to Kuruman. The latter road is already partly metalled and should be completed.

In order to further facilitate transport and travel a number of public wells or bore holes should be sunk along the different routes. Such sources of water supply, pushed well forward into the outlying parts, would facilitate travelling and settlement

LAND IN BECHUANALAND

(44). A very large portion of land within the area under consideration is held by large land companies and syndicates, by the Rhodesia Railways Ltd., or jointly by the Cape Colonial Government and the British South Africa Company. Those portions held by the British South Africa Company and the Rhodesia Railways Ltd., are known respectively as the First and Second Railway Grants.

The following is a brief history of certain of the larger blocks of land:—

First Railway Land Grant.—Granted to the Government of the Cape of Good Hope by the late Government of British Bechuanaland in terms of the first part of clause 6 of the Agreement dated the 23rd January, 1890, attached to Proclamation No 151 BB of the 15th July, 1892, for the construction of that section of the Northern Railway between the southern border of Bechuanaland and the Town of Vryburg. This section of the line having been taken over by the Cape Government prior to the 30th June, 1891, as provided for in paragraph 3 of the Agreement dated 23rd January, 1890, forming part of the Schedule to Act No. 13 of 1890, the said Government became a partner to the extent of 2 3rds, and the British South Africa Company to the extent of 1 3rd, in the above grant This land is now being disposed of in terms of a Resolution adopted by both Houses of Parliament on the 27th and 28th May, 1904, on the conditions set forth in the attached Notice No. 625 of the 5th June, 1908.

Second Railway Land Grant.—Granted to the Bechuanaland Railway Company (now Rhodesia Railways, Ltd.), by the late Government of Bechuanaland, for the construction of the Northern line of Railway between Vryburg and Mafeking as provided for in the latter part of clause 6 of the Agreement dated the 23rd January, 1890, attached to British Bechuanaland Proclamation No. 151 of the 13th July, 1892. This area was granted in Freehold to the Company unencumbered by any mineral reservations in favour of the Crown. The disposal of this grant is entirely in the hands of the Company.

Southern Lands Company.—The Block of farms belonging to the above Company was purchased from the late Bechuanaland Government on the 1st August, 1890, in accordance with the then existing regulations, viz., at 2s. per morgen, 1 6th or 4d. per morgen being a cash payment, and the remaining 5-6ths or 1s. 8d. per morgen, being represented by an annual quitrent equal to 5 per cent. on the unpaid balance. Titles to the various farms were issued on the 3rd March, 1892.

London and Pretoria Financial Co., Ltd.—This Company was formerly called the Bechuanaland Estate Syndicate who purchased a Block of 100 farms from the British Bechuanaland Government in August, 1890, upon similar terms to those above-mentioned, Titles being issued thereto on the 24th October, 1892.

Subsequently it was agreed between the Company and the Imperial Government that the former should surrender all its rights in the said farms and receive in lieu thereof, a free conveyance of thirty-three farms of 3,000 morgen each, subject to a perpetual quitrent of £3 per farm, and subject to the reservation of mineral rights to the Crown (vide Proclamation No. 235 BB dated the 8th November, 1895). This Agreement was carried out by the Cape Government, Title Deeds to the 33 farms being granted to the Company on the 13th November, 1900.

On the map of Bechuanaland attached to this report I have shown all the blocks of land held by various corporations. It cannot be said that the system of granting these vast areas to land to companies, whose whole object is not the development of the country, has been in any way conducive to the advancement of Bechuanaland.

FEATURES OF THE COUNTRY IN DETAIL.

(45). I will now describe the features of the country more in detail and in doing so it will be convenient to follow the main drainage lines or laagtes. Over the greater part of the country the farms are laid out in such a manner that each has access to a laagte as, generally speaking, it is

in the laagtes alone that water can be obtained. Hence in describing the valleys or laagtes and the country adjoining them I shall be describing practically the whole country.

MAFEKING CONVENTION FURROW. ...

(46). On the farm "Grootfontein," within the Transvaal, and some 4 miles due east of the village of Rooigrond, which is in the division of Mafeking and immediately adjoins the Transvaal border, there is one of the characteristic dolomite "eyes." The pool is almost circular and is situated on level ground and near the watershed. From the "eye" a furrow has been made to the Transvaal-Bechuanaland border mainly for the irrigation of land in the Transvaal. The furrow runs more or less parallel to the Mafeking-Lichtenberg road, its approximate length from the Fountain to the border being 6,000 yards In 1897 the flow in the furrow was roughly calculated by Mr. Edwards of the Public Works Department to be 3½ cubic feet per second. The farm "Grootfontein" and the adjoining farm "Valliefontein" belong to the Coetzee family. Of the water issuing from the "eye" on "Grootfontein" only a very minute portion is allowed to cross the border and flow on to the Rooigrond erven.

Water Hole at Logaging, Setlagoli.

(47). The marvellous difference in the quality of the soil on eith side of the Transvaal-Bechuanaland border is very striking. A short distance beyond the fence on the Transvaal side the dolomite is exposed on the surface and there is practically no covering of soil. The dolomite stops a short distance east of the boundary and after crossing a very narrow strip of the Black Reef series, the amygdaloidal rocks of Mafeking commence practically on the border. These give rise to the rich red soils which have given Rooigrond its name. All along the Bechuanaland side of the fence we have excellent rich soil which even without irrigation has great possibilities which will be specially mentioned elsewhere. So far as the Convention Furrow trouble is concerned the position is briefly this, that "Grootfontein" and "Valliefontein" have good water and no land, whereas Rooigrond has excellent land but no flowing water.

(48). At Rooigrond the surface soil is very fertile but of shallow depth, being underlain by calcareous tufa. This tufa is heavily charged with water. On Mr. Rowe's erf is an open pit about 70′ x 40′ and excavated to a depth of 13 feet, which is as deep as he could go owing to the water. In this pit the water rises to within two feet of the surface. A 12-feet windmill working a Lloyd's irrigation pump delivers water into a masonry tank. With a good wind the windmill will empty the well in 3 days, but it fills again in a night. Close to the well Mr. Rowe has sunk a borehole 42 feet deep in which the water also rises to within two feet of the surface and the supply has proved inexhaustible. The Lloyd's irrigation pump is said to be capable of irrigating 14 acres. Some little distance away Mr. J. W de Kock, M.L.A., on his farm "Spring Vallei," has three very good 6-inch boreholes in which water stands at 16 to 38 feet below ground surface. The success which Mr. de Kock has obtained in his efforts to grow lucerne and other crops on land much less favoured than the Rooigrond erven will be dealt with in detail elsewhere.

The Molopo River.

(49). The Molopo River rises on the farm "Molopos Oog, 266" in the Lichtenberg District of the Transvaal, at an approximate height above sea level, of 4,680 feet. The "Eyes" are situated ten miles south of Ottoshoop and about 5 miles south-west of the "eyes" of the Malmani River, and are separated from the latter by a ridge which rises to a level of 35 feet above the springs.

The discharge of the Molopo springs is at present 4·4 cubic feet per second, or 2,370,000 gallons per 24 hours. The Malmani springs which form the source of the Malmani River, one of the headwaters of the Limpopo, were in January, 1908, discharging 4·9 cubic feet per second, and in March, 1907, the observed discharge was 5·8 cubic feet per second, and are therefore equal in strength to the Kuruman spring. The Molopo and Malmani springs are said to be at approximately the same level. If anything, the Molopo "eye" is a few feet lower than the Malmani springs.

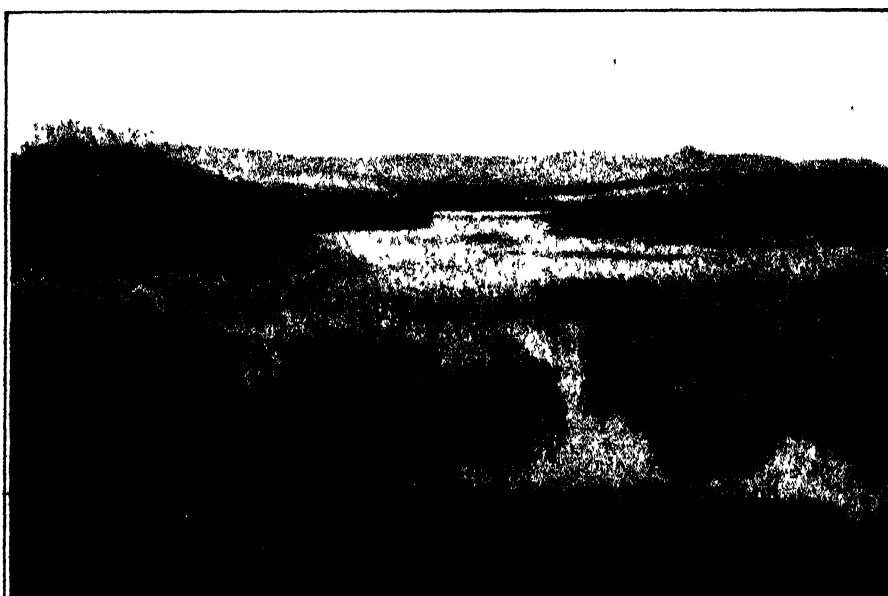
The total catchment area on the dolomite for the two rivers is approximately 240 square miles, of which topographically the greater portion belongs to the Malmani

The underground water level is on the western side, considerably higher than the Molopo River itself; a spring issues above the water level in the dam at the masonry weir ¾ mile below the "eye," and on the farm "Doornplaats," 7 miles lower down, the underground water level, at a mile from the river, stands 20 feet above the river bed. At this latter point the water can be seen in the famous "Wondergat." The hole is about 200 feet x 300 feet, and the depth of water is over 150 feet, so the quantity of water stored in this hole is very great

A masonry weir which holds up the water to a height of 4 feet, was built about 10 years ago three-quarter mile below the "eye" of the Molopo, but the fall of the Molopo River is such that the principal "eyes" were in no case submerged to a depth of more than a foot, and the water can be seen to be still bubbling up. There is a small pick-up weir 12 miles lower down on the farm "Rietvlei." The flow in the Molopo stops close below the masonry weir three-quarter below the "Oog." At the Rietvlei pick-up weir the water reappears but the flow is very small and the river is dry again before the Bechuanaland Border is reached. Between the "Oog" and the border there is sixteen miles of vlei, and here nearly all the water is dissipated. As the lower Molopo is quite dry, and there are no other springs in the district, and as the Black Reef divides the dolorite

in the Transvaal from the volcanic rocks in the Mafeking district, it seems probable that the whole dolomite area is feeding the Notwane River, which is another of the main tributaries of the Limpopo through the Lindkana springs

For these particulars, relating to the Molopo within the Transvaal, I am indebted to the Transvaal Irrigation Department. Most of the older residents at Mafeking and along the Molopo assert that this river was not very long ago a permanent stream for over 100 miles below Mafeking Elsewhere, in dealing with the rainfall and run-off in Bechuanaland, I have pointed out that the period from 1890-1895 was one of very exceptional rainfall, and under such abnormal conditions it is easy to believe that a constant flow was maintained in the Molopo River. I have it on the authority of an old resident at Sidilimolomo that this river was dry in 1886. The character of the valley bottom, which will be described later, is such that very considerable drainage is required to produce surface flow, and I think that the meoerrate rainfall during the last 10 years is sufficient to account for the absence of any visible flow during that period



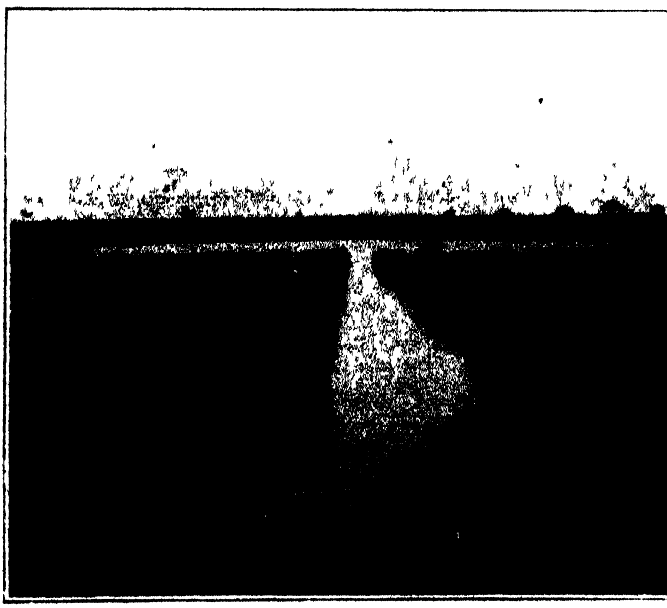
Vlei below Kuruman.

The popular impression from Mafeking downwards is that the drying up of the Molopo is due to the action of certain Transvaal farmers who, by constructing a dam near the "oog" or "eye" have turned the water from its natural catchment into that of the Limpopo catchment area. It is difficult to say exactly what has been the real effect of constructing the dam three-quarter mile below the "oog" already referred to above. It may or may not have had some influence on the subterranean flow through the dolomite, but the investigations of the Transvaal Irrigation Department show clearly that there has been no diversion of the water flowing in the river out of its proper catchment.

Considering the enormous value of water in the Molopo in its long journey through Bechuanaland, it is a great pity that its permanent source should be a few miles across the border in a neighbouring Colony

and subject to wasteful and uncontrolled exploitation by a few private individuals

(50) Before describing the Molopo lower down in its course, it is necessary to make a few remarks about a little tributary called the Magogwe Spruit, which also drains a portion of the dolomite area across the Transvaal border This spruit in its upper reaches is a swamp with a slight flow through it, the water being derived from strong springs issuing from the dolomite on the border farm "Mooimeisfontein," in the Transvaal It appears also that this spruit gets the benefit of much of the water from the Mafeking Convention Furrow which is wasted on the Transvaal farm 'Vallhefontein" Very good use is being made of this water by Mr J W de Kock, M L A, on his farm "Spring Valley," where a low dam made of sods has been built across the laagte and the water diverted into a furrow running along the right side and from which a considerable tract of sandy loam can be irrigated. The bed of the laagte consists of black vlei soil on which a variety of crops can be grown



Eye of Rooigrond Spring near Mafeking.

without irrigation. The possibilities of the farms along this spruit are very great, but Mr. De Kock is the first one who has really demonstrated what can be done with this country by skilful and intelligent farming Most of his land is at a considerably higher level than the laagte, and it is on this high land that Mr. De Kock has hitherto done most work, and has proved that dry cultivation of even lucerne can be carried on successfully

This matter is so important that I have dealt with it separately in another portion of this report.

(51). It appears also from Mr. Burrows' notes that much of the land along the Mogowani and probably also the Ramathlabama spruits is capable of similar development The Molopo crosses the railway to the north of Mafeking. It is here a narrow stream with a very small flow At the railway bridge there is a roughly built masonry weir, and at this point

the flow has been gauged daily since October, 1905. Below Mafeking the valley enters the great Molopo Native Reserve and assumes certain characteristics which are typical for the next hundred miles at least. Generally speaking, it consists of an almost level bottom of black vlei soil through which the dry river channel meanders with extreme tortuosity. On either side of the vlei bottom the black soil gradually changes into the typical red sandy soil of the country, and the valley is defined by undulating ground or kopjes which drainage from the sides has carved out from the adjoining plateau, and this gives the valley the appearance of running between ranges of low hills. Where the Molopo Valley is joined by its larger tributaries, such as the Madibi, and Ramathlabama Spruits, which are of the same type, this broken appearance is accentuated.

(52). At Pitsani, 45 miles below Mafeking, the landscape is relieved by a range of low hills through which the valley cuts by way of a poort, which reminds one more of Karroo conditions. These hills consist of banded ironstone, cherts, slates, together with diabase and dolerite. They commence within the Protectorate and extend in a long straight line running almost due south to the Transvaal border and belong to the Kraaipan formation.

Below Pitsani the valley becomes very monotonous. The bed is only a few feet below the general level of the country. It is very flat both across and longitudinally, and the sides are abrupt and consist of a hard, glassy conglomerate. The margins of the valley are indented to a very small extent by side drainage lines which adds to the monotony. Below Mabul, about 80 miles below Mafeking, the valley becomes a shallow laagte with thick forest on either side, and this character is maintained for a considerable distance, though I was not able myself to get further than Daly's Pan about 100 miles below Mafeking owing to the entire absence of water below Mabul.

Below Pitsani the river channel becomes very undefined. In places there are several small and shallow channels and in others there is no channel at all and I often saw cultivation extending right across the valley.

(53). As previously stated the Molopo is said to have been once perennial. During 1909, owing to the very heavy rains, the Molopo has been flowing once more, but for the past ten or twelve years there has been no proper flow and all water for drinking purposes is obtained from pits dug in the lowest part of the valley. Down to Mabul water can always be so obtained but beyond this only after good rainfall. At the time of my tour the pits at Pitsani were 4 feet deep and water in the well at Sidilimolomo was 16 feet deep. Watering cattle from these pits is a laborious business as the water is scooped up with buckets by a native standing in the pit, who hands it up to one or more natives standing above him and it is emptied into a trough made in the earth alongside. This process goes on from sunrise to sunset, is very slow and after the pits have been worked for some time the liquid baled up is evil looking black mud. Before the Rinderpest there are reported to have been over a hundred thousand cattle on the Molopo Reserve and though there can be nothing like this number now there appeared to me to be only just enough water to go round. With a good well sunk as at Sidilimolomo an excellent supply of very good water can be obtained.

(54). The Setlagoli River joins the Molopo a few miles below Sidilimolomo and after good rains brings down a considerable amount of water which replenishes the sub-surface supply in the Molopo if it does not produce a surface flow. After such rains the Natives spread down the river with their flocks and herds but come back to above Mabul as soon as the river dries up again.

About eight miles below Mabul the Native Reserve terminates, and the five farms 'Daly's Pan,' Nimrodsvlei,' 'Senegal,' 'Redmonds Hoek' and 'Blackheath,' which belong to the Daly family, lie along the left margin of the Molopo. These are the only Molopo farms in the Mafeking District. The right bank of the river throughout its course below its junction with the Ramathlabama Spruit lies in the Bechuanaland Protectorate but is identical in character with the left bank. The change from the Reserve to farm land is made obivious by the fact that, whereas the Reserve is with few exceptions completely burnt out and denuded of its bush and trees, the five farms mentioned are covered with thick forest growth. The valley bed is here not more than 10 or 15 feet below level of the marginal country. The trees are chiefly Kameeldoorn, Mimosa and Haakdoorn and many of them are of great size. Trees with a girth of 6 to 8 feet are common. The valley is not very wide here, not more than 100 yards, and winds about very much. As it has not been burnt for a long time it was covered with tall grass and reeds. Numerous lateral

Mashowing River near Motiton.

depressions run through the marginal country. These are evidently ancient channels of the river. One of these depressions forms what is known as Daly's Pan. A patch of reeds grows in the middle which indicates the presence of water at no infrequent intervals. The site is a favourable one for a well.

All these farms have been abandoned since the Molopo dried up in 1896 and the Daly's are now working farms on the Setlagoli just above the Native Reserve.

(55). Below 'Blackheath' there is a blank stretch of unalloted ground up to the Mafeking-Vryburg boundary. Beyond this there are two large blocks of surveyed farms. The upper block, with a frontage along the Molopo of about 33 miles, belongs to the "Bechuanaland Farms Ltd," and below that there is a block with a frontage of some 30 miles belonging to the Rhodesia Railway Ltd. Beyond that again there is unsurveyed Crown Land. Both those blocks stretch for many miles

inland from the river and their extent is shown on the map at the end of this report. Both blocks are wholly unoccupied though in former years this was not the case with the Bechuanaland farms block. Capt. Styles made a name for himself years ago on the farm 'Paddon' but he, like others, abandoned these parts when the Molopo dried up. The whole of this block is thickly wooded and has a range of kopjes running diagonally across it from North East to South West, consisting of banded ironstones and jaspers, and conditions are favourable for finding water. On one farm, 'Sweetwater,' which is traversed by the range of kopjes above mentioned, is a spring in a natural well 15 feet deep and 18 inches in diameter and the well is said to contain 10 feet of water.

(56) This block of farms was recently examined for the Land Company by Mr. Nimrod Daly, who knows this part of Bechuanaland intimately, and he kindly gave me a copy of his notes, from which I have made some extracts, as they give a good idea of this valuable block of land. Both these blocks are eminently suited for cattle ranching.

Storage of water on the Molopo is not feasible. Sites exist in several places where dams could be made and near Mafeking a few are in existence. Mr. Rowland of Mafeking has a dam in the Molopo which I was not able to visit. I inspected an old dam across that river about 6 miles from Mafeking which was breached and has been out of use for some time. This dam is about 10 feet high and was originally about 240 feet long. It is made of the black vlei soil which is not suitable for this purpose. Close to this dam another has been built across a laagte which joins the Molopo from the left. It is a low wall and in bad repair but still intact. Apart from the fact that these dams have a very precarious supply to depend upon, the great porosity of the valley bed makes a dam of this kind practically useless as the water soaks away through the bed of the reservoir almost as fast as it comes in To cut off the underflow at the dam by an impervious wall would in most cases be impossible. The only really promising site for a dam which I saw along the Molopo was in the Pitsani Poort. Here no doubt an efficient dam could be made with an impervious foundation.

In this case we have, for Bechuanaland, the very rare feature of the reservoir site not occupying the best arable land. At Pitsani the submerged area is of little use but below the poort the valley opens out, and for three miles there are large areas of excellent land suited for irrigation, consisting partly of vlei soil and partly of red sandy soil. At Pitsani we have unfortunately everything except the water which now is practically non-existent as surface flow. Pitsani is a very large Native "stad" or town and below the poort there is a great deal of cultivation extending right across the valley, the river channel, which is here about 20 feet wide and 6 to 10 feet deep, being wholly obliterated and ploughed over.

(57). Near the point where the Madibi spruit joins the Molopo I came across one of the few examples of 'zaai' dams in Bechuanaland which were made across some of the side laagtes.

(58). If the Molopo valley is unsuited for irrigation this does not preclude cultivation on a large scale. Throughout the length along the Reserve thousands of acres of the vlei soil are annually cultivated, mealies and kaffir corn being the staple crops. Shortly before my visit good rains had fallen and ploughing was everywhere in progress though the natives are not permitted to sow till the Chief at Mafeking has given the word. The same applies to reaping.

The Reserve is undoubtedly a fine stretch of country, but the pernicious practice of burning the veld has practically exterminated all the forest growth, though it is astonishing how rapidly this can be re-established if the country is protected. I have seen large areas of

burnt out country, which has been saved from fire and grazing for a few years, covered with young trees.

The width of the valley varies greatly. The black vlei soil varies from 100 to 300 yards in width with varying widths of red sandy soil along the margins. Excepting in the Pitsani poort the narrowest place is immediately above its junction with the Setlagoli where it is only 100 yards in width between the conglomerate bluffs. The tortuous river channel varies from 20 to 30 feet in width and from 3 to 6 feet in depth except in a few places where it practically disappears.

NOTES ON FARMS.

(59) Notes on farms in the Molopo Block belonging to the "Bechuanaland Farms, Ltd.," extracted from notes supplied by Mr. N Daly —

Farm "Sweetwater."—Has a natural well in conglomerate formation. 15 feet deep, 18 inches diameter, 10 feet of water. Hills partly covered with yellow-wood scrub. Flats wooded, Kameel and Wittedoorn trees. Veld excellent for cattle, and on south side also good for small stock. Live stock require salt.

Typical Pan in Dolomite near Morokwen.

Farm "Millwood."—Two wells, with water at depth of 10 and 14 feet. Flats well wooded with Kameel and Wittedoorn. Grass good, sweet, tall, and seedy, intermixed with short, curly Quagga grass. Splendid farm for cattle, and no doubt good for Boer goats, but not sheep. A good, strong supply of water would probably be found at a depth of from 30 to 40 feet.

Farm "Waterberg."—Has two natural wells, 350 yards apart, in conglomerate formation, both 8 feet deep. Farm good for cattle, the hill barren of timber or bush, but covered with good "Rooizaad" grass. Flats well wooded with Kameel and Wittedoorn and inferior scrub.

Farm "Springfield."—Has three wells, of which one is apparently good and strong. Splendidly wooded with Kameel and Wittedoorn, Wacht-een-beetje, Zwart haak, and Yellowwood. Good ploughing lands, suitable for mealies and Kafir corn. The Kafir goats live here without water. Good pasture for cattle, and Boer goats ought to do exceptionally well.

Farm "Achem."—Is densely covered with all manner of trees and bush, with the exception of one round spot bearing only Vaalbush. This open spot is

in the centre of the farm, and would be an ideal place for a homestead. Water would probably be found at no great depth. A better open spot of good veld for sheep and goats could not be wished for. The remainder of the farm is good mixed grass veld.

Farm "Putney."—Situated on the river, and exceptionally well wooded with Kameel, Likdoorn, Zwarthaak, Wacht-een-beetje, etc. Has good site for homestead on limestone ridge on river banks. Water should be found at shallow depth. This farm, and, in fact, all the river farms, would be excellent for Persian sheep and Boer goats, but Merinos not recommended.

Farms "Medenham," "Bega," "Rosenblatt," and *"Clare."*—All well wooded with trees and bush, but not so good as "Putney." Good mixed veld. Water ought to be found almost anywhere on the river bank. Numerous good sites for homesteads all along the river. It is superfluous to say how good all these farms are for cattle. The banks of the river for 100 yards or so have Kameel wood only, but after that it is mixed wood and bush, Wittedoorn and Haak being the most general. There are several small valleys running into the river on Putney, Medenham, Bega, Rosenblatt, and Clare, in some of which small dams could be made, but it would take a heavy thunderstorm to fill them, and then it is doubtful if they would hold water, as the soil is too sandy. A better idea for small dams would be to make angular dams, especially in the bends. These dams could be made so that they would not wash away. They would get full of water when the river is in flow, and the potclay soil would hold water well. A mile or so from the river there are numerous bare spots, some clear of all bush and trees. The whole of these farms are by no means covered all over with dense bush and scrub.

Farm "Sonnenberg."—The northern portion of half of this farm consists of a large bare flat, there being only odd trees, but plenty of scrub. The southern half is covered with Wittedoorn and Zwarthaak trees and bush. The veld is the same and as good as on the other farms. Good for cattle, but not small stock. No good site for homestead. A well was observed on the farm.

Farm "Nysna"—This is the best farm I have yet seen for all manner of live-stock. Clear open veld—all sweet grass, not long, rank, but short, curly quagga grass. Would be very good for Merino sheep and Angora goats, as well as other kinds of stock. Only small spots and clumps of Kameel trees on northern part of farm. The southern portion has more wood, *i.e.*, Kameel wood, Yellowwood, and a good deal of Yellowwood scrub, but the major portion of the farm is open level veld for small stock. Has very good ploughing ground almost anywhere in the northern part. Water ought to be got anywhere on the northern part at, say, 60' feet, and, if so, there are good places for homesteads, but in this instance I cannot define any special spots. This farm has a few hills running along the northern line—just on the line. Very good building flagstones on these hills.

Farm "Belvedere."—Is also a fair open farm, and also has plenty of Kameel wood and Yellowwood and inferior Yellowwood scrub and bush. Has very good open ploughing ground, bare of trees, with the exception of a few Vaalbushes. I did not see any good spots for wells, and there is no indication of water. The grass is good and sweet, but ranker than on "Nysna." There are some small sand kopjes or ridges, some bare and some covered with bush. They resemble small water "aars," but I would not hazard an opinion to that effect.

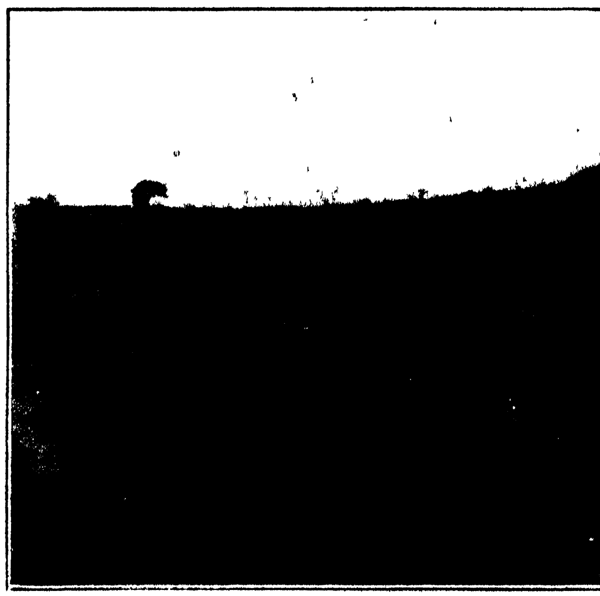
"*Farm "Clearstream."*—Is well wooded with Kameel, Yellowwood, Wacht-een-beetje, and Wittedoorn trees, and has very good veld, all sweet grass. A house commanding a nice view could be built on the hill on the north part of the farm, just on the line near enough to the natural well on "Sweetwater" to get water from same. The house would be about 400 yards from the well. There is a good spot for a well on the east bank of a small valley running through the farm which has limestone formation covered with Vaalbush. If water was found here it would be a nice spot for a homestead, though not so good as if built on the hill which commands a view of the whole farm. As the valley is very sandy it would be useless for a dam.

Farm "Woodbrough."—The whole of the western half of this farm is well wooded with Kameel, Wittedoorn, Withaak, and Zwarthaak, with plenty of inferior bush and scrub. The eastern portion, that part which the valley runs through, is very good for small stock. Merinos and Angoras would also do well here. There is a little Ganna bush (excellent for small stock) on bank of valley. There are three good spots for wells and homesteads on the east bank of the valley, about half to three-quarters of a mile apart. These spots are covered with Vaalbush and Limestone, whereas the other part of the valley is bare of bush. The valley is useless for dams, as the soil is too sandy, but it contains good ground for agricultural lands for mealies and Kafir corn. On the whole this is a good farm for live-stock. Every one of these farms is excellent for cattle.

Farm "Tennant."—The whole farm is splendid for cattle. The southern part especially at and above the junction of the Genesa valley and the valley coming through "Woodbrough," is very good also for small stock. Practically the whole farm is well wooded with Kameel and Wittedoorn, Wacht-een-beetje, Zwarthaak, etc.; not much scrub. On the river front there are many nice spots for wells and homesteads.

Farm "Paddon."—The veld just about the house is coarse and rank (though not sour), and not much good, but the whole of the other part of the farm is sweet grass. Well wooded with Kameel, Wittedoorn, and Zwarthaak, the two latter predominating. A very few small stock (say, 100 or 200, nor more) might do fairly well here. They would have to be Boer goats and Persians or Kafir sheep, not other sorts. Splendid course for cattle. The eastern part of the farm is much better all round than the western. The river front above the house is very good. There are good spots for wells and homesteads, especially one situated about half or three-quarters of a mile below the north-east corner beacon.

(60). The main tributary of the Molopo is the Setlagoli, which joins the Molopo a few miles below Sidilimolomo and about 75 miles below Mafeking. Above this point the Setlagoli with its tributaries, the Maritzani, the Madiban and the Mosita, is a much more important river than the Molopo and it differs from it in character. I will briefly describe the tributaries in the order named before dealing with the Setlagoli itself.



Maretsani River at "Buckreef."

THE MARITZANI.

This tributary rises just inside the Transvaal and follows a fairly straight course slightly to the North of West for 40 miles to its junction with the Setlagoli. This river crosses the railway at Maritzani Siding 22 miles south of Mafeking. At the crossing the waterway allowed is 50 feet between abutments. A gauge has been erected near the centre of the bridge and is being regularly read by the Railway Department but the site is not a good one for gauging the flow.

The zero of the gauge is 1·5 feet above the lowest part of the bed, the cross section is very uneven both above and below the gauge, and the river makes a sharp turn a short distance above, and is obstructed with stone and bush. The longitudinal slope is at this point about 23 feet to the mile.

Down to the farm 'Methuen,' 17 miles below the line, the river channel is well defined, the granite is near the surface and crops out in the bed and sides at various places, and for this season this section runs

well after rain. After crossing the barrier of Kraaipan formation which stretches from Pitsani to Kraaipan (vide paragraph 9 supra) the valley opens out more, and the channel runs in deep black soil underlain by calcareous tufa or rotten granite and gneiss all of which are exceedingly porous so that flood water seldom extends beyond 'Methuen' (vide paragraph 15 supra).

The farms lying along this river are very good indeed. The valley land is very rich and capable of bearing a variety of crops without irrigation though on the farms above 'Methuen' the flood water in the Maritzani should certainly be put to some good use. Underground water is uncertain. In Appendix C. is given a report by the geologist, Mr. Alex du Toit, upon possible sites for boring on the farm 'Moposgom' but the Smartt Syndicate put down 4 deep holes without getting any water. A borehole 212 feet deep on Buckreef yielded a very strong supply estimated at 72,000 gallons per diem, water standing at 40 feet below the surface.

On the farm 'Wienan' a small supply was struck at 120 feet depth. On the farm 'West End' a borehole 105 feet deep with water at a depth of 20—30 feet gives good water. Towards the lower end of the river the adjoining farms are beautifully wooded and every effort is being made to maintain them in this condition. The picture at the beginning of this report gives a typical view to the veld on the farms near the junction of the Maritzani and Setlagoli and fig. 3 gives a view of the Maritzani on the farm Buckreef.

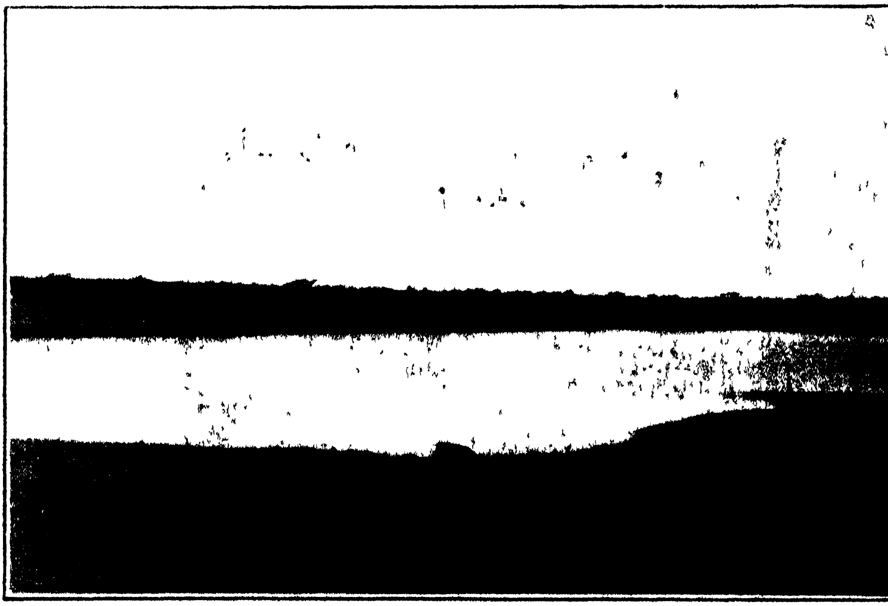
There are some good sites for the construction of dams at several points on this river, where solid granite crops out in the bed and up the valley sides.

It is of course not an ideal arrangement to have an earthen embankment founded on rock; but at the same time it will be found necessary to have a natural barrier across these Bechuanaland valleys to ensure the conservation of water without leakage. Rock-fill dams with masonry concrete or steel or concrete cores may be a solution. Two sites are especially noteworthy, one on the farm 'De Rust' just below Mr. Krause's homestead, and the other opposite the Messrs. Wright's homestead on "Never Set." These dams, together with the necessary furrows, would probably cost about £7,000: there is abundance of irrigable land which could be served. The farmers along this section would doubtless be more enthusiastic had they not let options upon their farms to gold prospecting companies. Messrs. Wright have two large well-made dams in side valleys on 'Never Set,' which hold water well, and one of them is used for irrigation; it is of earth, 20 ft. high at centre, and has stood for 15 years.

(62). On the farm 'West End' (African Farms, Ltd.) the Maritzani has lost its character as a river altogether, and consists of a wide shallow vlei with a small channel meandering through it and becomes so a typical Bechuanaland laagte. On this farm the valley cuts through a saddle consisting of decomposed granite and calcareous tufa with very little surface covering At this point Mr. Meintjes, who is the manager in charge of this block of farms, has constructed a large earth dam across the valley, of the following dimensions:—

Length at crest	1,760 feet.
Inside slope	35 ,,
Spillways, two aggregating	300 ,,
Outlets 2 No. 12″ diam. steel pipes operated from steel towers.	
Height of dam above Spillway	5 ,,
Capacity at full supply	2,000 million gallons.
Furrow on left bank 7,000 yards long—slope 1 in 3,000 leading to farm 'Sligo.'	
Shorter furrow on left bank.	

A puddle trench about 3 feet deep was cut across the valley. The dam is constructed with red sandy soil which is here heavily charged with particles of lime, and this may account for its retentive properties. A small dam near the homestead made of this material is quite watertight. A few miles higher up, on the farm 'Buckreef,' a dam built with the local sandy soil would not hold any water at all, and had to be lined with puddle. On the left side the 'West End' dam is taken down to decomposed granite and the left flank of the valley consists entirely of this and other equally porous material. The right half is taken down to a sandy loam which underlies the black vlei soil. The main overspill on the left is on tufa and rotten granite, the gravel overlying it was used to protect the slope on the water face in lieu of pitching. The dam, a picture of which is shown, is a bold piece of work.



Dam on Farm "Faith," Mosita River.

(63). The reservoir filled for the first time during the early months of 1909. The rottenness of the overspill caused considerable uneasiness but the dam itself has stood well and the percolation is remarkably small.

The lands which it is proposed to irrigate from this dam comprise from 200 to 300 acres of good soil, consisting partly of black vlei soil and partly of red sandy loam lying in the valley below the dam. Exception has been taken to the fact that flood water from the spillways will pass over these lands. This will be the case no doubt when there is any spill water, but meteorological records do not lead me to anticipate much trouble on this score.

Mr. Meintjes is an ardent exponent of up-to-date dry cultivation and from what I saw on his farms and elsewhere in Bechuanaland I am sure he will reap far greater benefits from this line of activity than from the dam. Trials with dry cultivation on the vlei soil below the dam for a considerable distance up the valley sides have I think proved that here again lucerne and certain other valuable crops can be grown without irrigation. Vegetables and fruits are doing well on the red sandy soil near the Homestead, being irrigated from a borehole by means of a 10'

Dandy windmill and pump. Peaches, plums, apples, vines and Cape gooseberries were all thriving. The great enemy of fruit trees are the white ants which kill the trees in a night by eating the bark. Constant war must be waged against these insects

The Metsima spruit with its tributary the Marokoa join the Maritzani on the farm 'Sligh' near the junction of the former with the Setlagoli These valleys are very similar in character to the lower reaches of the Maritzani, excepting that they are less wooded.

The Setlagoli

(64) Above its junction with the Maritzani this river is very similar to it and will therefore be described now

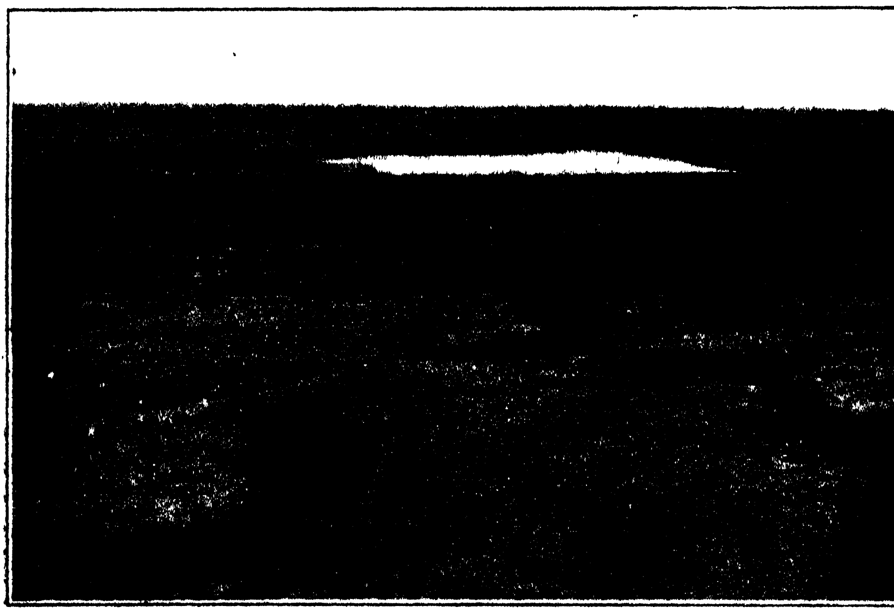
The catchment area of the upper portion of this river coincides roughly with the Setlagoli Native Reserve To some distance below the Setlagoli Crown Reserve it is, like the upper reaches of the Maritzani, a well defined watercourse with outcrops of granite and other rocks at frequent intervals along its bed and sides, which check the underflow and cause the river to run after rain and hold up subsoil water at a shallow depth below the bed.

The first point of interest is at the farm 'Winterhoek" where Mr Schultz wished to construct a dam to be fed by a furrow from the river. Mr. Burrows investigated this case and found an old furrow which was evidently constructed for the purpose of supplying the largest of several dams near the Homestead About 900 yards above the point where this furrow takes off from the river there appears to be a site for a first class reservoir where an earth dam of from 15 to 20 feet at the centre would impound a useful quantity of water. A large spillway would be required to carry off surface flood water which could be made on solid granite in the right bank. Mr Burrows recommended that instead of building this dam it would, for the present, be better ta repair the old furrow, build a small masonry weir in the river just below its offtake, (rock foundations being available) and raise the dam near the Homestead by another 3 or 4 feet, providing an overspill for surplus water. The more ambitious scheme for a big dam across the weir should be held in abeyance till the smaller scheme has been satisfactorily completed and developed.

Near the boundary between 'Conroy' and 'The Grange' and close to Mr. MacCaskill's house there is a jagged granite outcrop across the river At this point and for some 6 miles up and down stream the bed is composed of deep loose coarse sand and between compact banks of loam with occasional outcrops of granite and yellow clay. It is generally considered locally that the sand in the river bed moves forward at a fair rate and would cause much trouble in the reservoir by silting. If weirs intended for storage as well as diversion are built across this river, scouring facilities must be provided either by means of under sluices or falling shutters. Though it is possible to lead the water out at Mr. MacCaskill's reef, yet I am doubtful if it would be worth while, as there is little land worth irrigating within 3 miles of the weir site. Above this there is a considerable area of land which would be commanded, but there is very little soil.

(65) Near the junction of the farms 'Nonen,' 'Latham,' and 'Lynn,' Mr Meintjes of 'West End' showed me a site for a proposed dam across the Setlagoli valley. Rough surveys for this scheme were made by Mr. Burrows. The proposed dam would be about 3,000 feet long at the top and about 50 feet above the valley bed, but deep foundations would be

required. The overflow would pass over a "nek" on the right into the Koodoos spruit or Tutlani stream which also offers fair storage possibilities; and a dam some 25 feet high across the valley, just above its junction with the Setlagoli, where a reef crosses, would impound most of the overflow from the main reservoir. The capacity has not been surveyed in detail but would be very considerable, as the full supply contour extends 4½ miles up the river and is of great width in places. The catchment area is 177 square miles with a rainfall of over 20 inches, and a "run-off" of one per cent. would amount to 1,800 acre feet or about 500 million gallons. The land which would be submerged is held chiefly by Natives. The irrigable land lies in the valley bottom below the dam and is very extensive. 'Clober,' 'Sligo,' and 'Sherwood' would largely participate. Silting would undoubtedly be troublesome and the furrows below the dam would require lining. The scheme may be worthy of



Dam on "Blinkplaats," Mosita River.

investigation later on, but I think it is too ambitious for present requirements, more especially as so much can be done with the land which would come under the dam by means of dry cultivation.

On the farm 'Clober' Mr. S. F. Lamb has a large earth dam near his homestead but there is too little catchment to make it of any service. There are other dams existing and proposed on this farm in most of the side kloofs.

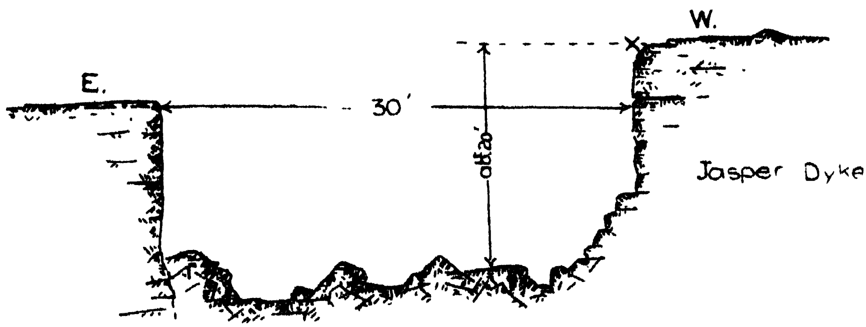
(66). Below the junction of the Setlagoli with the Maritzani the valley assumes the characteristics of a Bechuanaland laagte. Below its junction with the "Madiban" the granite lies near the surface and crops out frequently, but its character changes greatly when it joins the Mosita and flows in that river valley in a more northerly direction. The valley of the Mosita and that of the Setlagoli beyond the junction of the two rivers coincides more or less with the western belt of the Kraaipan formation and it will be best to consider the lower reach of the Setlagoli as part of the Mosita.

The Mosita.

On Mosita Reserve the belt consists principally of white or grey cherts, well banded, and containing thin layers of jasper and beds of magnetic and haematitic quartzites and slates. On the farm 'Parnell' the formation is absent for some distance, but reappears again in Moshesh and forms a band a mile wide through which the Mosita River cuts its channel diagonally.

On 'Blik Plaats' the beacon on the left bank of the river stands on a wide ridge of these rocks. The low hills on the east side are formed of massive white or buff cherts and banded translucent, white, grey, black and jaspery varieties. A conspicuous rock is a beautifully banded red jasper, often in thick beds and of wonderful brilliancy. Below 'Blik Plaats' the valley narrows and becomes deeper and through 'Kingsmill, 'Martin's Bush,' 'Logaging' and 'Harrietsberg' can almost be called a gorge. At 'Kingsmill' the Mosita and Setlagoli join. On these four farms the valley presents without exception the prettiest bit of country which I think will be found anywhere in Bechuanaland.

The river winds about in a narrow gorge consisting mainly of banded jasper, the beauty of which is difficult to describe and it is enhanced by the dense growth of bush. Close to Mr. N. Daly's homestead on 'Logaging' the gorge is very narrow and in two places only 30 to 40

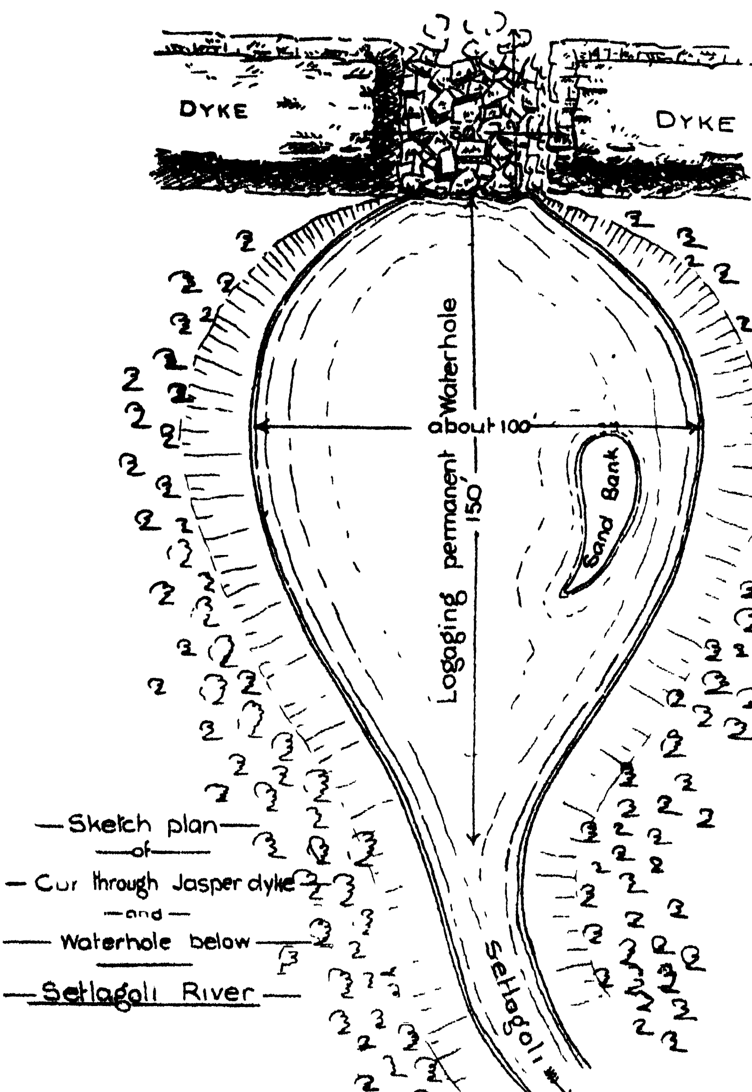


Section of Cut through Jasper Dyke, Setlagoli River.

feet wide. About a mile above the house several striking dykes cross the river and give rise to good water holes. The uppermost of these is very peculiar. It runs from West to East as a low but very well defined ridge and narrowing as it approaches the river and finally becomes a massive wall of beautiful banded jasper a few feet thick with smooth vertical sides, and about 20 feet above the river bed. Through this wall the Setlagoli has cut an almost perfectly rectangular opening 30 feet wide and the effect is most remarkable. During flood time the water must be headed up enormously to get through this narrow opening, and I found flood litter on top of the wall 20 feet above the sill of the notch. In falling over this natural notch a cistern has been formed below. The dykes crossing the river a short distance below have caused this cistern to be a permanent water hole which has given the Sechuana name Logaging to the farm. Sketches shewing plan and section of this curious natural feature are attached and also photographic views of the Notch. The presence of these permanent water holes makes Logaging a most valuable farm, as no other natural source exists for some distance above, and there is nothing below.

(68). The homestead and land at 'Logaging' and 'Martin's Bush' are about 50 to 160 feet above the river and the rock exposed is chiefly diabase overlain with calcareous tufa. Close to the homestead Mr. N.

Daly sunk a well to a depth of 101 feet chiefly through diabase. Water rises to 18 feet from the bottom but is undrinkable and poisonous, due probably to the presence of copper, surface indications of which are present all over the farm. A variety of other minerals have also been found on this farm Above the river there is plenty of good soil which



could be turned to good account with irrigation but this could only effected by lifting the water some 60 feet. The extent to which the water holes could be drawn upon by pumping is uncertain, and ev though fuel exists in unlimited quantities on these farms it will be lo before pumping with steam or gas power can be contemplated at a pla

so remote as this, excepting on a very small scale. Mr. Daly has been attempting to dam up one of the narrowest parts of the river gorge immediately below his homestead but failed as he did not go deep enough with his foundations, and I doubt whether he is likely to find rock at a less depth than 20 feet below the sandy bed of the gorge A small dam in this place will be valuable for stock raising purposes only. The square opening in the jasper dyke could also be closed up with masonry, but this work would require to be very carefully done, and as permanent water exists in the pool below it is doubtfull whether this storage could be turned to very useful account

Below Harrietsberg where the river enters the Molopo Native Reserve the Setlagoli valley resembles the Molopo valley between Setlagolomo and Mabul, and consists of a broad and flat bed of vlei soil, well covered with scrub, the sides being formed by nearly vertical bluffs of hard glassy conglomerate.

Jasper Dyke and Water Hole, Logaging, Setlagoli River.

(69) The soil in the Mosita valley is much heavier than that in any other Bechuanaland valley, and in appearance often reminded me of the "brak' Karroo soil This is due to the alluvium being derived from a large variety of rocks, chiefly from those of the Kraaipan series. Above its junction with the Setlagoli the valley is generally fairly wide and flat in section, with ranges of kopjes on one or both sides. At places it is hemmed in by these kopjes, and more big dams have been built across this river than across any other in Bechuanaland. The uppermost dam is on the farm 'Gemsbok Pan' and said to be 20 feet high. At this dam the valley bottom consists of vlei soil, tufa and rotten granite, and therefore does not hold water.

The second dam in on 'Klip Pan' said to be watertight. Both these dams are used for stock only.

(70). The next is on the farm 'Faith' belonging to the Hon. Mr. J. J. Keeley, M L C, and was built 14 years ago (see photo). It abuts on to jaspery rocks on the right and diabase on the left. It is 400 yards

long and 27 feet high in the centre and impounds a considerable amount of water; and as the valley bottom consists here of a fairly heavy loam the surrounding country is rocky, there is considerable run-off after good rain. When building the dam a mistake was made in not removing the surface silt under it. Had two or three feet of surface silt been removed an excellent watertight dam would have been obtained. This led to considerable leakage through the dam but in course of time this has steadily diminished and was very slight when I saw it. The dam is well made and of very fair material. It is well pitched on the upstream side. White ants are very troublesome and unless a constant watch is kept and nests destroyed, either by digging out the Queens or fumigating with bisulphide of carbon, a big dam may be easily breached. The ants are a great pest on the lands and in the orchards and gardens.

Owing to the leakage through the dam a large area of good land in the valley below the dam has been spoiled by *Brak* which seems to consist chiefly of Sodium Sulphate and probably common salt. The cattle are very fond of licking it. I recommended Mr. Keely to try growing various kinds of brak and salt bushes here.

Mr Keely contemplates raising the dam considerably but considering the nature of his foundations I hardly think this course advisable.

Some 100 morgen are commanded by the existing dam and he has some excellent established lands under oats, tobacco and fruit. Tobacco is the chief crop and the leaf produced is of very good quality There is a very extensive orchard of high class grafted trees. Peach, apricots, apple, pear and fig are all doing well.

Above the limit of command on the valley sides good crops of mealies are raised. The tobacco crop is fertilised with kraal manure.

Mr. Keeley has two smaller dams for stock purposes on the same farm in side kloofs.

(71). The next dam is on the farm 'Moshesh,' which also belongs to Mr. Keeley. This is 100 yards long, and is 20 feet high in the centre. This dam absorbs practically all the surplus flood water in the river, and is moreover watertight, and these are further reasons for not enlarging the dam on 'Faith.'

There is a considerable amount of cultivation in the valley below the "Moshesh" dam, extending about 1,000 feet across the valley, although only the central portion of this is irrigable. The water in this reservoir stands about half a mile above the dam.

Between the 'Faith' and "Moshesh" dams, Mr. Keeley commenced building another dam 20 feet in height across the valley, but stopped after constructing 75 feet of it. Below 'Moshesh' again is the Blikplaats dam, which is the last of the series, and was made many years ago by Mr. Daly (see photo). The site is a good one, and is at a point where the river cuts through the long line of jasper and iron stone kopjes. It is about 250 yards on top and 20 feet high. The water surface stands half a mile above the dam on to Moshesh ground, and is about 1,000 feet wide. It is fairly watertight, but the surface exposed is great compared with the depth, and evaporation must be excessive. This dam is put to no use now, as it never gets any appreciable supply of water, owing to the dams above. It is, however, a valuable adjunct to the farm 'Blik Plaats.'

It will be seen that the Mosita River is already fully exploited, though Mr. Keeley is the only one who makes the most of his opportunities.

The valley is well covered with scrub and bush near the river, but is generally denuded of trees elsewhere.

(72). On the farm 'Faith' the Police Barracks are built on a kopje a few hundred yards above Mr. Keeley's homestead on the west side of the valley on the junction of the granite and diabase. A well was sunk

by Mr. Keeley 102 feet deep, and an excellent supply was tapped from this junction of the two rock formations The well showed decomposed diabase on the west and very hard diabase on the east. The rocks on Mosita of the Kraaipan formation are, as in the other cases, auriferous.

(73). To complete the Setlagoli River system we must go back to the Madiban, which runs parallel to the Mosita, but some miles further east and in a granite valley

Upon the farms embracing the headwaters of this stream are a number of small dams, some watertight, others leaky; they are chiefly used for stock watering. On 'Boschkop' there are two small stock dams away from the river On Zwart Laagte a site was found for a small irrigation dam of moderate dimensions The dam would have a rock foundation. The valley opens out below the site favourable for the formation of 'lands Below 'Boschkop' the river runs through four farms owned by a native, who seemed to view the idea of investigations and Government assistance with suspicion He told Mr Burrows that he had a dam on 'Salem from which lands were irrigated

(To be continued.)

AGRICULTURAL UNION OF CAPE COLONY.

TWELFTH ANNUAL CONGRESS, 1909.

HELD IN CONJUNCTION WITH THE WESTERN PROVINCE VINE AND FRUIT GROWERS CONGRESS

(Continued from page 456.)

SECOND DAY, WEDNESDAY, SEPTEMBER 29

Congress resumed at 9 a.m The President (Mr C G Lee) in the chair.

Proposed Cape Town Exhibition

Mr. Kohler moved as an unopposed motion "That this Congress favours the idea of holding a South African Exhibition at Cape Town in 1910 and agrees to give such exhibition its heartiest support" Carried unanimously.

Agricultural College in the East

The adjourned debate on the above subject was resumed.

Mr. R. H. Struben moved: — "That this Congress notes with satisfaction that Parliament has appointed a Select Committee to enquire into the question of the most suitable locality, in the Midlands or Eastern Province, in which to establish an agricultural college, and would urge upon Government the necessity of initiating such establishment before the South Africa Union Act comes into force"

Mr. Arnold withdrew in favour of the amendment which was carried.

The Proposed Board of Agriculture

The subject of agricultural organisation then came up, and the President moved the resolutions passed at Bedford.

The following was the report of the Bedford Conference: —

Whereas it is desirable to establish an organisation by which the agricultural interest shall secure the attention which its importance demands—to attain this object it is hereby agreed that a Board of Agriculture be formed.

Constitution.

1. That the Board of Agriculture of the Cape of Good Hope shall consist of members from the executives for the time being of the existing agricultural organisations (viz., the Central Association, the Agricultural Union, Western Province Board of Horticulture, and Eastern Province Board of Horticulture), as hereinafter provided, who shall act as the medium between the several agricultural organisations and (*a*) the Provincial Government and (*b*) the Union Government, in respect of all matters decided upon by the various Congresses.

2. Representation of the several units on the Board of Agriculture shall be as follows:—The executive of the Central Association shall appoint four members, the executive of the Agricultural Union four members, and the executives of the Western Province and Eastern Province Boards of Horticulture each two members, and that Government have the right to send representatives from its technical staff to assist the Board of Agriculture in its deliberations.

3. That the Board of Agriculture is hereby authorised to act as an Advisory Board to the Government; and has full power to represent the several units, the Board's decisions being binding.

4. That each unit represented on the Board of Agriculture carry the number of votes to which it is entitled, as provided in clause 2, irrespective of the number of its representatives actually present at any meeting of the said Board, provided that no member of the Board may represent more than one unit.

5. That the Board of Agriculture shall elect each year a chairman and vice-chairman from among its own members, who shall have both a deliberative and a casting vote when presiding at meetings.

6. In the event of the chairman or vice-chairman being absent from any meeting of the said Board, a chairman shall be chosen from among the members present.

7. That a secretary, treasurer, and auditors may be appointed by the said Board.

8. The Board of Agriculture shall at its first meeting fix the number which constitutes a quorum.

9. That the Board of Agriculture shall, from time to time, send reports of their meetings to the several units, and in any case must report at least annually, which annual report shall contain an audited financial statement.

10. That any funds at the disposal of the Board of Agriculture shall be vested in the hands of the chairman and treasurer for the time being of the said Board, who are authorised to receive and disburse the funds of the Board.

11. In the event of any amendment to this Constitution being deemed advisable, printed copies of such amendment shall be forwarded to the several units for their consideration and acceptance, or otherwise, three months before the annual meeting of such units, failing acceptance by all the units it shall not be effective unless agreed to by at least two-thirds of the members of the Board of Agriculture at their first meeting thereafter.

12. That the Board of Agriculture shall co-operate with organisations in other provinces in South Africa having similar objects.

The report was signed by all the delegates present at the Conference representing the Central Association, the Agricultural Union, the Western Province Horticultural Board and the Eastern Board of Horticulture.

Mr. Kohler moved that the whole subject be postponed till the next Annual Congress of the Agricultural Union and that in the meantime steps be taken to endeavour to form a Board of Agriculture for United South Africa.

Mr. Edmeades seconded.

The Secretary, at this stage, announced that he had kept the Department of Agriculture fully informed as to the details of the movement as it progressed and the Minister for Agriculture had forwarded a lengthy letter dealing with the whole subject. This, it was agreed, should be read to Congress.

The Views of the Minister for Agriculture.

The letter, which was dated Cape Town, August 30, was then read as under:—

To the Secretary, Agricultural Union of Cape Colony.

Sir,—I am directed to acknowledge receipt of your letter of the 25th instant, enclosing copies of the draft Constitution of the proposed Board of Agriculture of the Cape of Good Hope, the establishment of which was recommended at a conference of representatives of the various agricultural organisations of this Colony.

In reply to your request for an expression of the Secretary for Agriculture's opinion on the proposed scheme, I am to say that it is observed that the organisations are proposed to be federated, and not unified, as was hoped for. Nevertheless, Mr.

Malan is gratified that a workable agreement has been arrived at by the delegates. In his opinion, amendments on the lines shown below would be advisable:—

1. After "agricultural organisations" in clause 1, line 12, the words "of this Colony" might be added, and for "Union Government" the words "Inter-Colonial Agricultural Union" might be substituted, as it seems desirable that matters affecting the Union of South Africa should be submitted to the Inter-Colonial Agricultural Union before being brought before the Union Government.

2. It is noticed that the draft Constitution is silent as to the relation of the proposed Board of Agriculture to the Inter-Colonial Agricultural Union. Will the Cape Agricultural Union continue to be alone affiliated to the Inter-Colonial Union? Is it not desirable that all the agricultural organisations of the Cape should be affiliated and that they should be represented on the latter Union by means of the proposed Board of Agriculture.

3. The draft Constitution does not say how the proposed Board of Agriculture is to become possessed of funds. Assuming that these will be supplied by the present organisation (or, at any rate, in part), it is possible that since these organisations remain independent units, they may individually decide to contribute to the funds of the Board in different proportions, or one or other may decide not to contribute at all, while each of the three organisations would continue to exercise the same voting powers. It seems to Mr. Malan that federation, as proposed in the draft Constitution, should be recognised and secured by regulated contributions to the funds of the Board of Agriculture.

4. It is conceivable, if not probable, that one organisation only may pass a resolution on a particular subject affecting the work of another organisation, which resolution, before being submitted to the Government, would, under the draft Constitution, be brought before the Board of Agriculture for its consideration; but the representatives of such other organisation might not be able to discuss the matter, through having no mandate from their own organisation, or not knowing the feelings of their organisation on the subject; the members representing the latter body would, therefore, probably feel themselves unable to discuss the subject until it has been referred to their association.

In conclusion, I am to say that this Department, having intimate knowledge of the manner in which resolutions of the agricultural organisations affect its work, is glad to have been afforded an opportunity of expressing its opinion on the draft Constitution, especially as it was not invited to send a representative to the Conference.—I have, etc.,

P. J. DU TOIT,
Under Secretary for Agriculture

Discussion then proceeded.

Mr. Kohler withdrew his original motion and substituted the following:—"That this Congress accepts the principle laid down by the Conference on Agricultural Organisation in Clause 1 of the Report, but seeing that certain amendments are necessary a committee be appointed to draft same and submit them to a further conference which shall have power to bring any decision arrived at into immediate effect."

Mr. R. H. Struben moved as an amendment:—"That the Congress accepts the scheme of agricultural organisation provided that the executive be given power to deal further with the whole question and take action in terms of the letter of the Secretary for Agriculture." Seconded by the hon. A. J. Fuller.

After further discussion the debate was adjourned to allow of Messrs. Kohler, Michau and Struben to come together to draft a resolution to meet the case. Congress then adjourned for 15 minutes. On resuming:

The Secretary announced that the following resolution had been drafted as acceptable:—"That this Congress accepts the scheme of agricultural organisation, provided that the Executive of the Agricultural Union together with the Western Province Board of Horticulture be given full power to deal with the general question, including the letter of the Secretary for Agriculture, and to take such action as may seem to these bodies most advisable."

The other resolutions having been withdrawn, Mr. Struben proposed the foregoing and Mr. Kohler seconded.

Mr. Douglass moved to have the word "provided" struck out.

Mr. Butler moved that the word "provided" be omitted and "further" substituted.

Both these amendments were withdrawn, and

Mr. Arnold moved seconded by Mr. Edmonds:—"That this Congress accepts the scheme of agricultural organisation and that the Executive of the Agricultural Union, together with the Western Province Horticultural Board be empowered to carry on any further negotiations which may be considered desirable; further that these two bodies include in these negotiations the letter submitted by the Secretary for Agriculture."

On going to the vote the amended resolution moved by Mr. Arnold was lost and Mr. Struben's resolution carried.

Joint Congress Next Year

Mr. Struben then moved as an unopposed motion:—"That this Congress instructs the Executive to make every endeavour to arrange, if possible, for the Annual Congress in 1910 to be held in conjunction with the Congresses of the Central Association (Farmers Congress) and the Western and Eastern Province Horticultural Boards, and that the Minister for Agriculture be invited to preside" Carried unanimously.

Supply of Cereal Seed

Mr. Swart moved: "That the Government be requested to import rust-proof cereal seed to assist the farmers." Seconded by Mr. Human.

After discussion the resolution was carried in the following form: "That the Government be requested to import further quantities of rust-proof cereal seeds, such as Rietti wheat and Algerian and Texas oats, to be re-sold to the farmers."

Ocean Freights on Live Stock.

Correspondence was submitted by the Executive showing the negotiations which have proceeded with the Government and shipping companies in the endeavour to get the ocean freight charges on live stock reduced. The Secretary explained that reductions had resulted but these freights were still too high in the opinion of the Executive.

Mr. Edmeades suggested a special committee to deal with the subject.

The hon. A. J. Fuller proposed a deputation to wait upon the representatives of the shipping companies to discuss the whole question. He moved that the deputation consist of the President, with Messrs. Everitt, Rabie, Edmonds and Edmeades.

This suggestion was adopted and the Congress adjourned until 2 p.m.

AFTERNOON SITTING.

The President took the chair at 2 p.m.

The first business before Congress was

The Election of Officers for the Ensuing Year.

The Secretary announced that the members of the Executive who retired in accordance with the rules were: Messrs. Evans, Edmeades, Warren and Albertyn, who were all eligible for re-election. It would be necessary to elect five members to complete the Executive.

Mr. Struben moved, seconded by Mr. Malleson, that the following gentlemen be elected to fill the vacancies on the Executive: Messrs. E. T. L. Edmeades (Oudtshoorn), O. E. G. Evans (Bedford), C. Heatlie (Worcester), J. H. Swart (Caledon) and C. Arnold (Queenstown). These being the only nominations were declared duly elected.

The president then vacated the chair, and Mr. P. Ryan, as one of the vice-presidents, took his place.

Mr. C. Heatlie nominated Mr. C. G. Lee as president for the ensuing year. There being no other nominations he was declared duly elected amidst great applause.

Mr. Malleson proposed the re-election of the two retiring Vice-Presidents, the hon. P. W. Michau, M.L.C., and Col. W. E. Stanford, C.M.G., M.L.A. These gentlemen were also declared duly elected.

THE W.C.T.U AND THE CONGRESS

The President having resumed the chair and thanked the Congress for the honour conferred upon him, announced that he had been able to meet the committee of the W.C.T.U. in regard to the request for an interview. He understood they desired to meet some representatives of the Congress in order to discuss the question of unfermented wines and the extension of the dried and preserved fruit industry.

Mr Heatlie proposed the following as a deputation: Messrs Rabie, L. Cloete, W. A. Krige, J A C Faure and the mover. Agreed to. At a later stage.

Mr. Krige reported verbally that the deputation had interviewed the members of the W.C.T.U. He said it appeared that the object of the ladies in desiring to see a deputation was to try to get some basis of co-operation with the farmers in the matter of using Colonial products. What they desired was to encourage the use of Colonial raisins, unfermented wine, and the like, aiming at temperance. Of course, he did not blame them for that, and he had promised on behalf of the fruit-growers that they would do all in their power to improve and increase the output of these articles.

The report was adopted.

THE DESTRUCTION OF LOCUSTS.

Mr. Z. B Grové moved: "That an act be passed making the destruction of locusts compulsory." Discussion ensued at some length.

Mr. C. A. Pope moved: "That this Congress desires to record its appreciation of the efforts put forth by the Government in the past in destroying locusts and urges that these efforts should be in no way relaxed." Seconded by Mr. Edmeades and carried unanimously.

THE TREKKING OF SCABBY SHEEP.

Mr. Z. B. Grové moved: —"That the Scab Act and Pound Laws be made more stringent as regards the trespassing and trekking of infected stock over uninfected farms with a view to giving the farmer who has clean stock more protection than at present exists under the Act."—Seconded by Mr. P, A. Myburgh, and carried.

SOUTH AFRICAN NATIONAL UNION.

Mr. Kohler moved as an unopposed motion, seconded by Mr Malleson:—"That seeing that the objects of the South African National Union are similar in character to those of the Agricultural Union, earnest efforts should be made to secure mutual co-operation for the achievement of those objects." Carried unanimously.

Compulsory Inspection of Fruit.

Mr. Kohler moved as an unopposed motion that the Government be asked to state whether they intend to bring forward a bill this session to provide for the compulsory inspection of fruit. Seconded by Mr. Malleson and carried unanimously.

The Tuberculin Test.

Mr. Malleson moved seconded by Mr. J. Starke:—"That the Government be requested to give greater facilities for testing cattle for tuberculosis than at present exist" The motion was adopted.

East Coast Fever.

Mr. Edmonds moved, seconded by Mr. Arnold:- "That the resolutions upon East Coast Fever passed by the Border Conference held recently at Queenstown, be supported by this Congress."

The resolutions were read as under:—

(1) "That while not in favour of the indiscriminate slaughter of in contact herds, the Conference advocates the prompt slaughter and burial of all sick beasts, all contact cattle to be quarantined."

(2) "Seeing that in the view of the Conference it is impossible to stop the spread of the fever when it has once entered the Native Territories, a line of fence should be erected and guarded dividing the Territories from the Colony proper, the cost to be met by a tax on the cattle in the Colony proper, the Territories to be served by railway only."

(3) "That the Government be requested to increase the belt of country between Natal and the Colony to a depth of at least six miles, all cattle to be removed from this belt, the owners having the option of selling at Government valuation or finding veld elsewhere, the Government to endeavour to supply farmers within the belt with mules or donkeys to carry on farming pursuits a row of dipping tanks to be erected within the Colony ten miles from the belt and ten miles apart; all cattle travelling by road or rail to be dipped before starting, the dip being supplied by the Government at cost price within the ten mile area."

(4) "That dipping be compulsory in tick-infected areas, that Divisional Councils be empowered to erect dips where necessary, the Government to erect tanks where there are no Councils; permits to remove cleansed cattle to be only issued by authorised persons."

(5) "That the Conference views with approval the wish of the Government to co-operate in stamping out the disease in Natal."

(6) "That the Conference wishes to draw the attention of the Government to the great risk of transmitting the disease by human beings in their clothing, particularly in native karosses."

(7) "That no pains or expense be spared in the thorough supervision of the fence on the Natal border."

(8) "That interested bodies be apprised monthly of the progress of the disease and the efforts to combat it."

(9) "That the Government be requested to grant facilities to farmers wishing to protect themselves in case of an outbreak."

(10) "That Conference wishes to place on record its appreciation of the efforts of the respective Governments to combat the spread of the fever, and assures them of the desire of the people in the districts represented to afford every assistance."

Discussion proceeded at some length during which the Under-Secretary for Agriculture explained the whole position.

Col. Stanford moved as an amendment, seconded by Mr. C. Southey: "That this Congress approves of the measures adopted by the Government on the borders of East Griqualand and Pondoland to prevent the entry of East Coast Fever, and appreciates the support accorded to these measures by the people—both European and native—in East Griqualand and Pondoland. Further that this Congress urges upon the Government the necessity, in the interests of the Colony, of preparing in good time for defensive action on the southern and western borders of the Transkeian Territories, thereby securing an effective second line of defence, should the disease unfortunately extend to the Transkeian Territories."

Mr. Edmonds withdrew his motion, and the amendment proposed by Col. Stanford was unanimously carried.

TAX ON GREYHOUNDS.

Mr. Bulmer moved, seconded by Mr. R. Starke:—"That the Grey hound tax be levied on owners of ground, as well as non-owners, possessing such dogs." Carried.

IMPORTED EGGS AND POULTRY THEFTS.

The Cape Town and Western Province Poultry and Pigeon Society wrote conveying resolutions advocating the marking of imported eggs, and the inclusion of poultry thefts in the Stock Offences Act.

The President said they all felt the need for helping the poultry industry, which was a very important one, and doubtless some resolution would subsequently be come to on the subjects brought to their notice.

Referred for consideration and action by the Executive.

FARM LABOURERS CHARACTER PASSES.

Mr. Grové moved that farmers be urged not to employ labourers unless they have character passes from their last employers

The motion fell through.

GATES ON PUBLIC ROADS.

Mr. J. Starke moved.—"That the Government empower Divisional Councils to limit, according to the requirements of their respective districts, the number of gates within certain distances on main and public roads." Seconded by Mr. E. Lange and lost.

PAY TRAINS ON RAILWAYS.

Mr. C. Human moved that pay trains on Government railways are unnecessary, and great saving would be effected by their abolition.

As there was no seconder the resolution was not put.

ANIMAL HOSPITAL.

Mr. W. F. Duckitt moved that the Government be asked to establish an animal hospital at the Agricultural College to enable the students to study animal diseases, and that stock sent to such hospitals be sent free of charge.

The motion was carried without discussion.

DONKEY STALLIONS.

Mr. Myburgh moved that the Government be respectfully requested to import more Catalonian donkey stallions.

Mr. Edmeades seconded and the resolution was adopted.

RAILWAY PASSES TO SHOW JUDGES.

Mr. Pope (Molteno) moved that in view of the great importance to agricultural societies of securing the services of suitable judges, irrespective of distance, the Government be requested to increase the number of free railway passes granted to judges.

It was decided that a deputation be appointed to interview the Minister for Agriculture to urge that greater facilities be given in regard to the travelling judges. The deputation was appointed as follows: Messrs. Minnaar, Hoole, Pope, Arnold and Weeber.

Mineral Ores for Analysis.

Mr. C. Heatlie moved that, for the purpose of developing the resources of the country, Government be requested to grant further facilities to property owners, by allowing them to send samples of mineral ores to the Government for report and analysis free of charge.

Seconded by Mr. Duckitt and carried.

Railway Fares to Shows.

Mr. Myburgh moved, seconded by Mr. Minnaar:—"In view of the fact that, owing to the considerable decrease in Governments grants, agricultural societies are largely dependent upon gate money for their existence and that the increase in railway fares has been found to seriously diminish this source of revenue and curtail the usefulness of agricultural shows by keeping away the very persons to whom the show is likely to be of benefit; Government be earnestly requested to take into consideration the question of making some further concessions over the Cape Government Railways to visitors attending shows, and if possible to revert to the concession for many years in force, viz., half single fare for the double journey."

It was decided to refer this to the deputation appointed to represent the matter of judges tickets.

The Authority of the Union.

Mr. Malleson moved:—"That the Government be requested to frame a regulation under which grants to Agricultural Societies will not be paid until a certificate has been obtained from the secretary of the Agricultural Union to the effect that the society concerned has complied with the rules and resolutions of the Union."

Mr. Edmeades seconded.

Mr. Heatlie moved, as an amendment, that the matter stand over to the next Congress.

The amendment was agreed to.

The Congress then adjourned until the next morning at 9 o'clock.

THIRD DAY.—THURSDAY, SEPTEMBER 30.

The President took the chair at 9 a.m.

The first business on the paper was a resolution tabled at the previous sitting, as follows:—

Mr. Struben moved:—"That this Congress strongly urges Government, with a view to the fuller development and encouragement of irrigation in this Colony, to introduce at an early date, legislation for the emendation of the Irrigation Act of 1906 in the following respect:—To differentiate between "spring" waters, or normal flow, and the "flood" waters or additional flow due to the fall of rain, of permanent streams, so that riparian owners on perennial streams may have the right of storage of their due and reasonable share of the "flood" waters, whilst the rights to the use of the "spring" waters or normal flow shall remain as at present." Mr. Butler seconded.

Mr. Edmeades moved, as an amendment, that the whole subject should be postponed so far as this Congress was concerned.—Carried.

Prizes for Dried Fruits at Large Shows.

The following letter from Mr. Rowland Taylor, of Wellington, submitted through the Paarl Farmers Association, was read:—

I would like to bring two matters forward. In giving prizes at the big shows for Dried Fruits, the following should be considered:—*A. Varieties*: For instance, a prize is sometimes given for the best dried apricots. We have Cape, Royal, and Monpark. The latter is planted to such a limited extent as not to be a merchantable proposition on a large scale. The former two are, but they cannot be compared at a show. They should be kept absolutely apart as varieties. *B.*: The same exhibit should not be shown on any two shows. This would prevent one exhibit being hawked around for a couple of years, which has occurred. *C.*: That quantities should be considered in awarding prizes; a farmer could have a certificate for same. *D.*: That medals be awarded at the big shows in lieu of money, so that competition would become keen. The award could be used as an advertisement by the exhibitor.

Mr. Kohler moved that this letter be recorded and published in the minutes.—Agreed to.

The Excise.

Mr. Krige moved:—"That in the opinion of this Congress the Excise should be abolished."

Mr. Heatlie seconded.

Mr. Smuts moved as an amendment:—"That this Congress strongly urges upon the Government the serious position in which the wine industry is placed at present and is of opinion that the Excise should be modified with a view of reducing same." Seconded by Mr. Struben.

After discussion:—

Mr. Kohler suggested the addition of the words "on the products of the vine," to the original resolution. This was accepted and the resolution then read: "That in the opinion of this Congress the Excise should be abolished on the products of the vine."

On going on to the vote the President declared the amendment lost and the original resolution, as amended, carried.

Mr. Struben called for a division, which resulted as under: For Mr. Smuts' amendment: Messrs. N. E. Smuts, C. A. Pope, C. F. F. Truter, A. P. Everitt, W. A. Edmonds, H. Fitchat, S. Smith, J. Rawbone, C. D. Davis, T. T. Hoole, R. H. Struben, and C. G. Lee—12.

Against. Messrs. C. W. H. Kohler, E. Lange, R. Cloete, W. H. Lategan, L. Cloete, C. Neethling, J. S. Minnaar, W. A. Krige, J. P. Louw, W. H. Roux, R. J. Bulmer, Z. P. Grové, W. E. Wessels, J. C. Neethling, D. J. de Wet, J. Butler, J. A. C. Faure, P. Ryan, W. F. Duckitt, J. Starke, J. Malan, M. W. Weeber, S. W. Joubert, A. P. N. du Toit, P. R. Rabie, J. F. Kirsten, E. T. L. Edmeades, C. L. Matthews, P. R. Malleson, C. Heatlie, P. A. Myburgh, C. J. Human and P. H. Swart.—33.

In the division on the original motion Mr. Butler voted against that also, the voting being reversed, but th enames otherwise were exactly the same. The ultimate result was that the original motion as amended by Mr. Kohler was carried by 32 to 13.

Imported Plants and Seeds.

Mr. A. P. N. du Toit moved:—"That it be impressed upon the Government that there should be more careful supervision in connection with the introduction of plants, seeds, etc., from oversea than at present exists with a view to preventing the introduction of insect pests."

After discussion the mover agreed to amend the resolution to read: "While appreciating what has been done in the past, this Congress urges that there be no relaxation of inspection of plants, seeds, etc., imported from oversea with a view to preventing the introduction of fungoid diseases and insect pests." Mr. C. Heatlie seconded this and it was carried.

Import Duty on Malt

Mr. Heatlie moved:—"That it be suggested to Government that the import duty on malt be increased to at least double the present rate."
Mr. Du Toit seconded Carried.

Advertising Cape Produce.

Mr. R Cloete moved:—"That effective steps should be taken for the better advertising of Cape Fruit and other produce in England." Seconded by Mr L. Cloete, and carried

Deputation Re Compulsory Inspection of Fruit

The Secretary announced that the Minister for Agriculture replied *re* above, that the matter was under consideration.

On the motion of Mr. Malleson, the following were appointed as a deputation to wait upon the Minister for Agriculture to inquire what steps were being taken to introduce a Bill to provide for the compulsory inspection, with powers of rejection, of export fruit. Col. Stanford, Messrs. Michau, Heatlie, L. Cloete, and Malleson. The deputation was instructed to report to the W.P. Horticultural Board

Cold Storage on Mail Boats.

Mr. R. Cloete moved:—"That the Government be requested to see that sufficient cold storage accommodation be provided on the mail boats, having regard to the future expansion of the export fruit trade."
Seconded by Mr. L Cloete, and carried.

Formation of Judges' Section.

The following was then read by the Secretary:—

The Committee appointed to consider the question of the formation of a judges' section beg to submit the following recommendations:—

1. That a Judges' Association be formed as a section of the Agricultural Union of the Cape Colony.
2. That the following five gentlemen be asked to act as a first Executive Committee for the proposed judges' section:—R. H. Struben, C. G. Lee, P. R. Rabie, Chas. Southey, and Hon. A. J. Fuller.
3. That this Executive Committee be asked to decide as to the qualifications of the various gentlemen whose names have been submitted by the various Agricultural Societies and Farmers' Associations, or whose names may be subsequently submitted, and to place those they select on a list as qualified judges to form the nucleus of the proposed judges' section. The Committee shall have the power to add to the list the names of any persons whom the Committee may be satisfied are qualified to act as judges of the various classes of stock and produce.
4. That as soon as convenient thereafter steps shall be taken to convene a meeting of the members of the judges' section, which meeting shall have power to elect its own Executive; and the Executive shall thereafter be the governing body of the section, and shall decide, by means of examination or otherwise, as to the qualifications of any person whose name shall be submitted as a judge.
5. That the funds necessary for carrying on the judges' section be contributed by the Union. The Committee recommend that a grant of £25 be made for the purpose of starting the organisation, and that a special contribution be asked for from the various Agricultural Societies.

C. G. Lee, Chairman.
A. A. Persse, Secretary.

29th September, 1909.

Mr. Edmeades moved the adoption of the report. Seconded by Mr. Malleson, and carried.

The Place of Next Congress.

Mr. Edmeades moved that the next Congress be held at Cape Town. Seconded by Mr. Du Toit.

Mr. Southey moved that this matter be left to the Executive to decide. Seconded by Mr. Fitchat, and carried.

Delegates to Inter-Colonial Congress.

Mr. Truter moved, seconded by Mr. Fitchat and carried, "That the matter of selecting delegates for the next Intercolonial Congress be left in the hands of the Executive."

Amendment of Rules.

Mr. Struben gave notice of the following amendment of the rules which he wished circulated for the consideration of affiliated societies before being brought before the Annual Congress of 1910:—

I. To amend rule 12 to read: Societies or Associations with a membership of up to 100 shall be entitled to one delegate to Congress; of from 100 to 300 members, two delegates; and over 300 members, three delegates.

II. To amend rule 6 as follows: The amount of the annual subscription payable to the Agricultural Union by each affiliated Association or Society shall be two guineas for each delegate to which it may be entitled.

III. That the following new rule be added: That should a division on a resolution be called for, votes shall be counted by the number of votes to which any unit of the Union may be entitled, irrespective of the number of its delegates actually present at Congress, but no unit shall be entitled to vote unless represented by at least one delegate, who shall vote on behalf of one unit only.

IV. That the following new rule be added: The votes of the Executive Committee shall be counted per capitum.

The South African National Union.

Sir Pieter Bam, M.L.A., at this stage addressed the Congress thanking them on behalf of the S.A. National Union, of which he is chairman, for the sympathetic resolution adopted. He trusted the Agricultural Union would co-operate with them in their endeavour to foster the development of South African industries.

Votes of Thanks.

The President, at this stage, announced that the business of the Congress had concluded and proposed a hearty vote of thanks to the Minister for Agriculture and the officials of the Agricultural Department. Carried.

Mr. Edmeades proposed a hearty vote of thanks to the Mayor and the Corporation of Cape Town for the courtesy and consideration during the sitting of the Congress.—Carried.

Mr. R. J. Bulmer proposed a hearty vote of thanks to the Committee and members of the Civil Service and City Clubs for their kind hospitality to the visiting members of the Congress.—Carried.

Mr. Fitchat proposed hearty votes of tanks to the Principal of the Elsenburg Agricultural College and the Manager of the Government Wine farm at Constantia, for the invitation to visit those centres and to the Western Province Agricultural Society for kindly volunteering to provide carriages for the members.—Carried.

Mr. Butler having proposed a hearty vote of thanks to the President and honorary Secretary, which was seconded by Mr. Fitchat, the proceedings terminated.

AGRICULTURAL ZOOLOGY FOR SOUTH AFRICAN STUDENTS.

BEING A COURSE OF LECTURES ON AGRICULTURAL ZOOLOGY, DELIVERED BY DR. J. D. F. GILCHRIST, PROFESSOR OF ZOOLOGY AT THE SOUTH AFRICAN COLLEGE, IN CONNECTION WITH THE TECHNICAL EVENING CLASSES INAUGURATED BY THE SCHOOL BOARD OF THE CAPE DIVISION.

(Continued from Page 329.)

ANNELIDA OR SEGMENTED WORMS.

In passing to this group we find a decided advance in organisation. Firstly, there is a more specialised means of progression, the body being usually provided with bristles called *chaetae* or *setae*, which are lodged in pockets or pits in the epidermis. These are, however, merely projections of a *thin cuticle*, not definite limbs as in higher groups. The number of these setae may be large as in sea worms, small as in earth worms, or very reduced as in leeches. Secondly, the bilaterally symmetrical *body is segmented* or divided up into sections, each of which is typically provided with bristles, the name Annelida refers to these ring-like segments. Thirdly, the digestive tract is surrounded by a large cavity which is lined by a special layer of cells. This definite cavity is known as the body cavity or *coelom*; in it arise the reproductive elements, and it is also connected with the process of excretion of waste products by special tubes or nephridia. Fourthy, as is to be expected, the *nervous system* is also more specialised than in the previous group, and consists typically of a brain or cerebral ganglia connected by a ring round mouth region to a ventral chain of ganglia. The *circulatory system* is also well developed. A characteristic feature of some forms is that in their development from the egg they pass through a larval stage known as a *Trochophore* or *Trochosphere*, which is markedly different from the adult.

Lumbricus (Fig. 41), the common earthworm, may be taken as a type to illustrate the group. The most of the indigenous earthworms of South Africa are small and belong to the family of the Acanthodrilidae. They are to be found in moist and shady places, in ravines and forests, and even around the edges of temporary pools which are formed in winter. Very large earthworms are found in some places in the Eastern Province, some growing to a length of four or five feet and looking rather like snakes than earthworms. They may be found after heavy rains or floods. They belong to the genus Microchaeta. A third section of South African earthworms is represented by imported forms and includes the genus

Lumbricus as well as Allolobophora : these, which are suitable for examination and dissection, can be got in gardens and cultivated ground, as for instance the large L rubellus It is an interesting fact that the introduced forms have a markedly different habitat to that of the native forms

The *external characters* of Lumbricus are not very complex. Its elongate rounded body is covered by a thin, slippery and glistening *cuticle*, which is slightly iridescent owing to the presence of very fine lines A dark streak—the dorsal blood vessel—may be seen along the back. The body is divided up into a great number of sections or *segments*. About half a dozen of these (31st-38th segments) are at one point swollen into a ring-like thickening called the *clitellum* This thickening is due to the presence of a number of ectodermal glands, the secretion from which forms the cocoons in which the eggs are laid Rows of minute bristles (*chaetae*) may be felt along the side and under the surface of the body, there being eight of these in each segment (The segments and bristles are best made out in a specimen killed by placing in alcohol) It is by means of these bristles that the animal is able to crawl about, an improved means of locomotion as compared with the movement effected by the cilia in the flat worms or the wriggling of the round worms, and perhaps not unconnected with other features of the body of the earth-

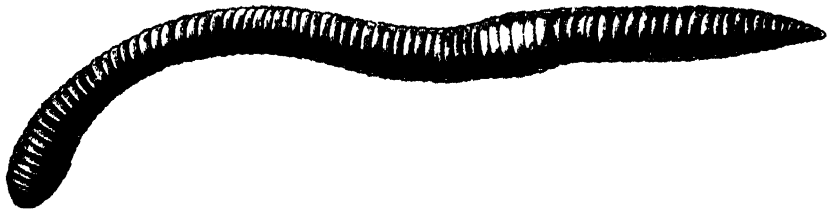


Fig. 41. The Earthworm *Lumbricus rubellus*. The most conspicuous segments indicate the region of the clitellum. (Sedgwick after Eisen)

worm such as its segmented nature, the large body cavity and muscular body wall. Other external characters of the body are the following various apertures: the *mouth* immediately behind an overhanging part or prostomium, the *anus* at the posterior end of the body, two slit-like pores on the 15th segment which are the *openings of the male genital organs*. The other openings are minute, namely. paired openings of the *nephridia* or primitive kidneys, situated latero-ventrally, on each segment except the first and the last, a median *dorsal pore* opening into the body cavity in the groove between each segment behind the tenth, two openings on the ventral surface of the fourteenth segment, these being the *openings* of the *female reproductive organs*, for the earthworm is hermaphrodite; two pairs of openings between the ninth and tenth and the tenth and eleventh segments leading into pouches or reservoirs (spermathecae) in which the spermatozoa from another earthworm are stored up.

The *alimentary system* of the earthworm begins with the mouth, which leads into an oral or *buccal cavity* extending over three segments. There are no teeth in this mouth cavity, and the taking in of food is probably by the sucking action of the *muscular pharynx* which reaches from the third to the sixth or seventh segments. Following the pharynx is the long *oesophagus* or gullet which leads into an enlarged part the *crop*, in which food may be stored up before passing to the next part the *gizzard* which has strong walls and grinds up the food before it passes on into the long intestine where it is digested and absorbed. This intestine is straight, but its inner surface is increased by a dorsal fold or *typhlosole*,

which projects downwards into its cavity. The intestine is covered by a number of *yellow cells* whose function seems to be chiefly excretion of waste products (Fig. 42). There are few glands in connection with the alimentary tract. There are, however, three pairs connected with the oesophagus, which secrete a limy fluid possibly of assistance in the digestion of the food. They are called, from the nature of their secretions, *calciferous glands*.

If an earthworm be laid open by an incision along the dorsal surface, these various parts of the intestine may readily be seen, and it will be observed that they are not in immediate contact with the muscular wall of the body, but that they lie loosely in a large space (the *coelom* or body cavity) being connected to the side of the body only at intervals by thin partitions These partitions or *septa* are formed of a double layer of thin cellular membrane which is also reflected on to the body wall and intestine, thus forming a closed cavity (the coelom) at each segment of the body. The septa therefore are part of the body cavity.

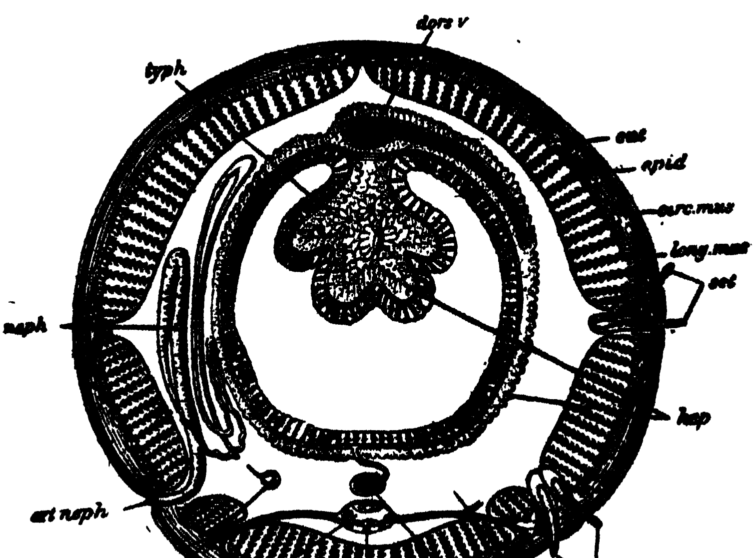


Fig. 42.—Transverse section of *Lumbricus* the earthworm. *circ. mus*, layer of circular muscular fibres; *coel.*, coelom; *cut.*, cuticle; *dors. v.*, dorsal blood vessel: *epid.*, epidermis; *ext. neph.*, external opening of nephridium; *lep.*, yellow excretory cells; *long. mus.*, longitudinal muscle; *neph.*, nephridium; *nephrost.*, nephrostome or internal opening of nephridium; *n. co.*, nerve chord; *set.*, bristles or setae; *sub. n. vess.*, sub-neural blood vessel; *typh.*, typhlosole; *vent. v.*, ventral blood vessel. (After Marshall and Hurst.)

The vascular or blood system is well developed. The blood is red on account of the presence of haemoglobin and contains corpuscles or cells. The haemoglobin however is not in the corpuscles as in vertebrates but is in the fluid. A *dorsal blood vessel* already noted runs along the body just above the alimentary tract. In this the blood flows forward. Under the intestine is a *sub-intestinal vessel* in which the blood flows backwards. (Fig. 42.) A third but smaller vessel, the *sub-neural*, lies below the ventral nerve chord and has at each side of it a smaller *latero-neural*. These vessels are connected with each other. There is no single heart

but in the seventh to the eleventh segments there are five pairs of vessels connecting the dorsal and sub-intestinal vessels and by the contraction of these "hearts" at regular intervals from above downwards the blood is kept in circulation.

Excretory System: The *yellow cells* on the intestine, (like the reproductive cell parts of the wall of the coelom), are probably connected with the removal of waste products from the system into the body cavity. From there the waste products may be carried to the exterior by a pair of tubes or *nephridia* which occur in all the segments with the exception of the first four (Fig. 42, *neph.*). Such tubes also themselves extract waste products from the system. They are surrounded by a network of fine blood vessels from which they extract the finer excretory matter in the blood thus acting both as ducts and as excretory organs. The more complex excretory organs (kidneys) of higher animals are simply masses of complex tubes comparable to the simpler nephridia of invertebrates. A nephridium of Lumbricus consists of a long coiled tube situated in a segment. One end of the tube is muscular and opens to the exterior in the same segment. The other end opens on the septum by a ciliated funnel into the segment in front. The whole of the excretory organ between these two parts consists of cells which have been compared to drain pipes as they are hollow and form parts of fine tubes. All of the nephridium is essentially a part of the septum (*i.e.*, of the coelom) except the muscular end which is ectodermal in origin.

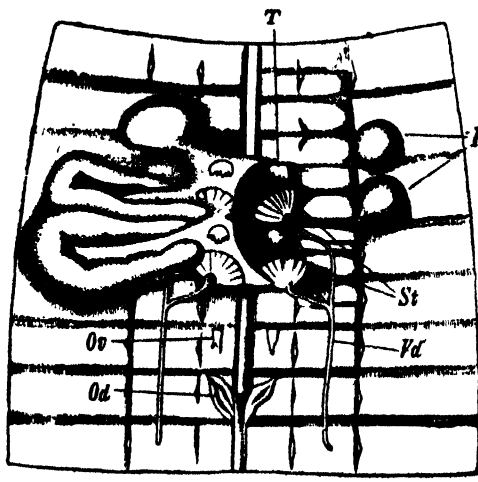


Fig. 43.—Reproductive organs of Lumbricus. *T.*, testes ; *St.*, funnel-like openings of the vas. deferens : *Vd.*, vas. deferens : *Ov.*, ovary ; *Od.*, oviduct · *Rc.*, receptacula seminalis or spermathecae, one-half of the seminal vesicles and spermathecae of the one side have been removed. (Sedgwick's *Text Book of Zoology*, after Hering.)

The *reproductive system* (Fig. 43), is complex, the male organs consisting of (1) a pair of small *testes* on each side of the nerve chord between the ninth and tenth segments and between the tenth and eleventh segments, (2) saccular outgrowths of the septa, called *seminal vesicles* in which sperms are matured and stored up; when fully developed these sacs cover over and conceal the testes in dissection, (3) *vasa deferentia* with large funnel shaped openings concealed by the seminal vesicles from which they carry the sperms to the exterior by an opening in the fifteenth segment. The *female organs* consist of (1) two pear-shaped *ovaries*, attached to the posterior side of the septum between the twelfth and thirteenth and fourteenth segments situated on the septum between the thirteenth and fourteenth segments and opening into the first by a ciliated funnel and to the exterior in the second; on the oviducts are little swellings or egg-receptacles (receptaculum ovorum) in which a few eggs can be temporarily stored. (3) Two pairs of sperm receptacles or *spermathecae* in which the sperms from another earthworm are stored up before being used to fertilize the

The sperms are packed up into little packets or spermatophores.

Cocoons are formed of the secretion from the clitellum. As this secreted matter passes backwards over the genital openings, ova are deposited in it and then spermatophores. The eggs are thus fertilized externally. The cocoons found in or on the ground are brown seed-like bodies.

The *nervous system* consists of a double nerve chord with ganglia or little swellings of nerve cells at each segment. This lies on the ventral side of the body, anteriorly, however, these nerves pass round the pharynx and meet each other above in two dorsal or cerebral ganglia which may be called the brain. Though earthworms have no eyes or very specialized sense organs, they are sensitive to the light, they can apparently seek out their food by smell and are rather discriminative in the kind of food they select; they can perceive slight vibrations of the ground which may warn them of approaching danger.

Earthworms are of considerable importance in agriculture. (1) They burrow deep down in the soil, generally obliquely, sometimes to a depth of eight feet or more. The soil is thus loosened allowing the entrance of air and moisture besides giving additional facilities for the deeper penetration of roots. (2) Again they feed to a large extent on earth containing comparatively little nourishment. Thus large quantities are passed through their bodies, carried out of their burrows, and deposited on the surface as "worm castings." There is thus brought about a constant turning over of the soil and that from a greater depth than the agriculturist can manage. This turning over of the soil amounts in the course of time to a great deal more than one would imagine. Darwin, who studied the habits of these animals carefully, calculated that in some localities as much as ten tons of earth per acre is annually brought to the surface in this way. The result is that the finer soil is gradually brought up while the coarser soil, large stones, as well as bones, shells, animal and vegetable matter, are buried beneath the surface. Thus the soil is not only exposed to the air and inconvenient coarse stones removed, but it is enriched by vegetable and animal matter which may thus sink into it. (3) The earthworm not only feeds on soil containing nutritive matter, but it comes out of its burrows chiefly at night and attacks and devours leaves, seedlings etc., which it draws into its burrows. It is an important agent therefore in the creation of the dark rich soil (humus) on the surface of the earth, which is known to occur in regions which but for the action of the earthworm would be sandy wastes. The earthworm not only benefits man in this way but it affords an important food supply for most kinds of birds, fishes, frogs, moles, and insects.

There are a few things, however, to be set over these numerous benefits to man and beast. They devour leaves of vergetables, seeding plants, potatoes, etc., and may cause considerable damage though only in a restricted area. In such cases they may be collected when they come out of their burrows. It has been found that a decoction of walnut leaves poured into their burrows causes them to crawl out (Bos).

The Annelida may be divided into two main classes: I. The CHAETOPODA or those with conspicuous bristles or chaeta. This class includes two orders—the terrestrial and fresh water forms (OLIGOCHAETA) with few chaetae and the marine forms (POLYCHAETA) with many chaetae. II. The HIRUDINEA or leeches which have rarely any chaetae and are parasitic forms provided with an anterior and posterior sucker for attachment to their host.

Class I.—Chaetopoda.

Body rounded, with *chaetae*, and rings corresponding to *internal segmentation* of the body. *Coelom* well developed.

Order I.—Oligochaeta or Earthworms and Fresh-water worms.

These have few chaetae as compared with the marine worms. The reproductive organs are fewer in number and more localized. They are hermaphrodite and their development is direct, that is without a larval form. The various tentacles, gills, parapodia, and other organs found in the marine worms are absent. Lumbricus, the type above described, is a member of this group. Two sub-orders are recognised (1) those chiefly inhabiting the land (Terricolae), and (2) those mostly found in fresh water (Limicolae).

Order II.—Polychaeta or Marine Worms.

These are abundantly represented in South Africa. One large section consists of free living forms (Errantia) and specimens of these may be found under most stones between tide marks. They usually progress by crawling but some of them can swim. They may be readily recognised by the lateral projection of the body bearing fine bristles, conspicuous in such forms as Nereis (Fig. 44). Other forms are permanently lodged in tubes constructed of sand and secretions from the body (Sedentaria). A striking object in many pools is the brightly

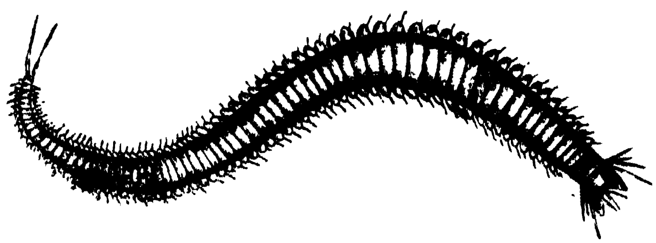


Fig. 44. —A Free-living Marine Worm *Nereis pelagica*, showing sensory tentacles of head and the segmented body provided with parapodia and bristles or chaetae. (Ehlers.)

coloured flower-like structure which on being touched or disturbed instantly disappears into a leathery like tube. This is the head and head appendages of a sedentary polychaete. (Bispira volutacornis, Fig. 45) found both in Europe and South Africa. At certain localities, as for instance at Camp's Bay, large masses of what appears like loose sandstone occur which on examination are found to be composed of the tubes of sedentary polychaetes (Sabellaria capensis) and fragments of these sandy worm tubes are often found on the beach. A very large marine annelid, Arenicola the Lob-worm, is a characteristic form of some shores in the Northern Hemisphere. This has recently been found also in South Africa. It lives in burrows in the sand.

The chaetae or bristles of the Polychaeta are not only numerous but they are usually supported on projections from the body which are, however, very simple and not definite limbs. These projections (*parapodia*) occur in the segments of the body, one on each side. Each however may be divided into two parts, an upper, towards the back of the animal (*notopodium*), and a lower, towards the ventral side, where the nerve chord lies (*neuropodium*). In these the bristles are inserted and there is usually one of them which is larger and more deeply embedded in the body wall than the others (the *aciculum*). In addition to these there is often a projection or *cirrus* on the notopodium and this sometimes takes the form of a gill. There may also be a ventral cirrus attached to the neuropodium.

Not only may the body be divided transversely into segments, but there are also two muscular divisions dividing it into three *longitudinal partitions*.

The head is well provided with sensory organs in the form of *tentacles* and there are also often special respiratory organs or *branchiae* in this region (Fig 45).

Fig. 45 -A Sedentary Marine Worm, *Bispira volutacornis*, showing the head region with repiratory organs. Lateral view of head and upper part of body; about natural size. (After McIntosh)

The sexes are generally separate and the young pass through a larval stage quite unlike the adult and known as a *trochosphere* (Fig. 46). It is usually pear-shaped with a sensory organ at the apex, the mouth at the side and the anus at the tapering base. Circles of ciliated bands usually occur round the body, and by these the larvae can swim about.

Class II. Hirudinea or Leeches

We have already seen that a parasitic mode of life often leads to great changes in the organism chiefly in the direction of degeneration of organs required in a more active life. The leeches are mostly blood sucking parasites, and the modifications brought about by this habit are considerable. It is only comparatively recently that it has been ascertained that they are in reality transformed chaetopoda. It was supposed that they had no chaetea, but these organs have been found in some members of the group, and this fact together with the discovery of some points of similarity in their development to that of oligochaetes indicates their real affinity. They differ, however, from the previous orders not only in the *comparative absence of chaetae* but by the presence of new organs adapted to their mode of life, namely an *anterior sucker* round the mouth and a *special posterior sucker* recalling the sucker of the trematodes; the fact that the *body cavity is absent or very much reduced* is suggestive of the same affinity. It is, however, present in the young and also in one genus of the leeches, so that its absence is only a secondary character. The *body is segmented* though the segments do not correspond to the ring seen on the outside of the body. The nervous system is not very different from that of the earthworm. Nephridia are present though somewhat different from those of the other chaepotoda. Leeches are hermaphrodite, the genital pores being single and median in position.

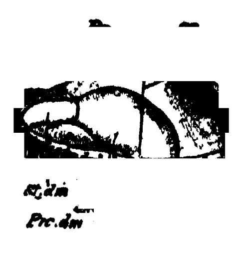


Fig. 46.—A Trochosphere. *An. ci.*, anal cilia; *Br.*, brain: *Stut.*, stomach; *Msd'.*, mesodermal bands: *Pro. dm.*, intestine; *Pr. or. ci.*, prae-oval circlet of cilie; *St. dm.*, gullet. (From Parker's *Biology*, after Fraipont.)

The most familiar form is the leech used in the practice of medicine HIRUDO MEDICINALIS (Fig. 47) and it shows the typical modification for parasitic life. It was formerly much used by medical men at a time when blood-letting was supposed to be a cure for various ills of the human body. By means of its two suckers it is able not only to fasten itself on to its host but to move about by a sort of looping movement. The

mouth is provided with hard teeth by means of which it is able to pierce the skin. Large quantities of blood can be drawn at a time and stored in the "crop." Coagulation of the blood is prevented by the secretion of glandular cells in the pharynx. The crop is enlarged by several pairs of saccular outgrowths the last of which is the largest. Digestion does not, however, take place here but in a comparatively small stomach which follows the crop.

Fig. 47.—*Hirudo medicinalis*, about life size. Showing mouth (on the right) and large posterior sucker (on the left.) (Shipley.)

Blood sucking leeches are often troublesome as they attack animals which come to the water to drink. The Horse leech (LIMNATIS NILOTICA, Fig. 48) is specially troublesome as it does not live on the skin but enters the nostrils and mouth of horses, and may cause great loss of blood. Other leeches also called horse-leeches are not blood suckers but live on worms, etc.

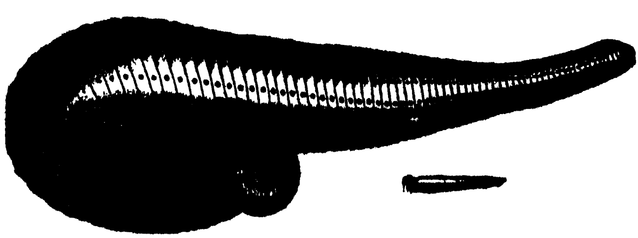


Fig. 48.—*Limnatis nilotica*. The Horse Leech. Natural size and young leech. (Railliet.)

The leeches of South Africa are not well known HIRUDO CAPENSIS, a form of about 57 mm. in length, has been found in stagnant pools on the Cape Flats, and a species occurs occasionally in great numbers in dams apparently not a blood sucking species as its crop is filled with mud. The peculiar marine leech provided with jills (Branchelion) is also found in South Africa as well as the other marine leeches.

Classification of Annelida.

Class I.—Chaetopoda.
Order I.—Oligschaeta, *e.g.*, Lumbricus, Allolobophora, Microchaeta.
Order II.—Polychaeta, *e.g.*, Nereis, Sabellaria, Arenicola.
Class II.—Hirudinea, *e.g.*, Hirudo medicinalis H. capensis, Limnatis nilotica.

(*To be continued.*)

ANIMAL DISEASES—CONTAGIOUS AND INFECTIOUS.

Summary of Outbreaks of Contagious and Infectious Animal Diseases Scheduled under Act No. 27 of 1893.

Still under Quarantine on 30th September, 1909.

District.	Anthrax.	Epizootic Lymphangitis.	Glanders.	Lungsickness.	Redwater.	Scabies (Equines.)	Sponsziekte.	Tuberculosis.	Totals.
Alexandria	1	...	...	...	...	...	2	...	3
Lady Grey	...	...	...	...	...	...	1	...	1
Barkly West	...	...	...	1	...	...	...	...	1
Cape	...	...	...	...	...	1	...	3	4
East London	...	...	...	4	...	...	1	...	5
Humansdorp	...	1	...	...	...	2	...	...	3
Kimberley	1	...	1	...	...	...	...	...	2
King William's Town	...	...	...	7	1	...	3	...	11
Komgha	2	...	...	...	...	...	2	...	4
Mafeking	...	...	...	...	...	...	5	...	5
Mossel Bay	...	...	1	...	...	...	...	...	1
Peddie	...	...	...	1	...	...	...	...	1
Port Elizabeth	...	...	...	...	...	1	...	...	1
Tembuland.									
Umtata	...	...	...	10	...	...	...	...	10
Engcobo	...	...	...	16	...	...	...	...	16
Mqanduli	...	...	...	4	...	...	6	...	10
Elliotdale	...	...	...	5	...	...	2	...	7
Transkei.									
Butterworth	1	...	...	5	...	...	1	...	7
Kentani	2	...	...	4	...	...	4	...	10
Nqamakwe	...	...	...	5	...	...	...	...	5
Tsomo	...	...	...	2	3	...	...	...	5
Idutywa	...	...	...	9	...	...	1	...	10
Willowvale	...	...	...	11	...	...	6	...	17
Pondoland.									
Libode	...	...	...	5	...	...	...	...	5
Ngqeleni	...	...	...	3	...	...	...	...	3
Lusikisiki	...	...	...	3	...	...	...	...	3
Bizana	...	...	...	...	...	...	3	...	3
Flagstaff	...	...	...	2	...	...	...	...	2
Tabankulu	...	...	...	14	...	1	...	...	15
East Griqualand.									
Mount Ayliff	...	...	...	1	...	...	...	...	1
Umzimkulu	1	...	...	...	...	...	2	...	3
Qumbu	...	...	...	5	...	...	...	...	5
Tsolo	...	...	...	15	...	...	...	...	15
Mount Frere	...	...	...	1	...	...	...	...	1
Maclear	...	...	...	2	...	...	...	...	2
Mount Fletcher	...	...	...	...	...	...	1	...	1
Totals	8	1	2	135	4	5	40	3	198

(Sgd.) J. D. BORTHWICK, Chief Veterinary Surgeon.

Office of the Chief Veterinary Surgeon,
Cape Town, 2nd November, 1909.

EAST COAST FEVER

STATEMENT RELATIVE TO THE SAFEGUARDING OF THE COLONY OF THE CAPE OF GOOD HOPE AGAINST THE INTRODUCTION OF EAST COAST FEVER FROM THE ADJOINING COLONIES OF NATAL AND TRANSVAAL

The following is a resumé of the steps which have been taken by the Government for safeguarding this Colony against the introduction of East Coast Fever from the adjoining Colonies of Natal and Transvaal. The main considerations which have been kept in view are efficient fencing of the Borders, adequate patrolling of the fences and an embargo on the introduction from the infected Colonies of animal produce, grass, hay and other articles which are capable of conveying infection.

The disease has not been reported from the Bechuanaland Protectorate, but in view of the fact that a comparatively small portion of the Protectorate-Transvaal Border is fenced, our Protectorate Border is also guarded

The following is the distribution of the guards employed and the strength of the respective cordons on the three Borders as well as the Ports of Entry for trade purposes:—

Cape-Bechuanaland Protectorate Border (about 300 miles).—Guarded and patrolled between Ramathlabama and Kuis by 19 C M.P and 3 Native Detectives. Camps established at Ramathlabama, Pitsani, Tsedilomolomo, Packenham, Detlaraping and Morokwen

Cape-Transvaal Border (about 262 miles).—Guarded and patrolled by 34 C.M P. and 1 Detective. Camps are established at Christiana Gate, Thornhill, Kopje Enkel, Home Rule, Pudimoe, Malalaring, Mosymiyani, Broeders Puts, Welverdiend, Rosaquali, Kraaipan, Maritzani Eye, Rietfontein, Rooigrond, Malmani Road and Ramathlabama.

Cape-Natal Border (about 330 miles).—Guarded and patrolled by 109 C M.R. and 220 Natives. Three special Native Detectives are also employed in each of the Districts of Umzimkulu and Bizana Camps are established at Bonnyvale, Stanford's Drift, Brighton, Middleton, Riverside, Railway Camp, Arnold's Drift, Waterfall, Umfulamuhla, Union Bridge, Stranger's Rest, Middleford, Gloucester, Iron Latch, Gugweni Gate, Harding Gate, Staffords Gate, Ingeli Gate, Amanzimyama, Boshof's Drift, Owen's Camp, Mjika Camp, Webster's Drift, Davies' Camp, Impindweni, Lugie, Middledrift, Gunther's Camp, Clark's Camp, Leecon Camp and Umtamvuna Mouth

At the end of 1907 the strength of the three cordons was as follows —

Bechuanaland Protectorate: Nil.

Transvaal 25 Non-commissioned Officers and Privates of the Cape Mounted Police, 1 Native Private and 1 Detective.

Natal · 95 Cape Mounted Riflemen and 32 Native Guards.

A recent inspection of the Cape Colony-Protectorate Border near Kuis (the most westerly point guarded by this Government), made by the local sub-inspector of the C.M.P., indicated the advisability of stationing men in the vicinity of Kuis and Madebing, and mounting them on camels, as, owing to the long distances to be traversed and the scarcity of water, supervision on horseback was out of the question. Three camels have been purchased for this purpose. Patrolling of this border has so far had a moral value only, for the reason mentioned. Fencing of this border is not considered necessary at the present time, although the fencing of the por-

tion from Ramathlabama to Pitsani may require further consideration in the near future as illicit introductions generally occur along this section, which has a length of about 45 miles.

Border Fences.—The frequency with which repairs of the Transvaal Border fence were needed suggested a thorough inspection of this fence. As a result it is found necessary to overhaul the whole line of fence, which consists in part of four and five wires only. The strengthening of the fence is now nearing completion. When these repairs are completed the fence will be serviceable and durable and will consist of six wires throughout, except on the farm "Home Rule" where the standards, being driven into hard, rocky ground, could not be raised so as to carry an additional wire to bring the fence up to the desired height of 4 feet 6 inches. No advantage would have been gained by making this particular section of the fence a six strand one, as it would have necessitated at least two of the wires being placed within an inch or two of each other, and even then would not have reached the desired height or in any way added to the efficacy of this section for keeping cattle out.

In those sections of the fence carrying seven wires, the extra strand has been inserted by the owner of the farm which the fence traversed in order to render it proof against small stock.

All additional and renewed wires are barbed and all unsound poles have been replaced with iron standards.

On the Natal Border the fencing of the section Boshoff's Drift to the sea (Pondoland Border) was completed at the end of September, 1908 Owing to heavy rains and washaways, the failure on the part of one of the successful tenderers to reach expectations, and the length of the boundary turning out to be nearly double the distance anticipated, in view of the course taken by the Umtamvuna River, this fence was finished about three months later than was intended. The fence erected for Rinderpest purposes, having been in existence from the Drakensberg to Boshoff's Drift and since repaired, it was only necessary, in order to complete the fencing of the whole of the border, to erect the section from Boshoff's Drift to the sea. In the beginning of 1908 considerable pressure was brought to bear in favour of a clear zone along the entire border, and a belt of 800 yards was established, from which all cattle were excluded except cattle to be milked or yoked and those used for the cultivation or removal of produce and transport of goods from the Ports of Entry in that section of the zone extending from the Basutoland border to Ingeli. This was, however, found to be impracticable and also likely to alienate the border farmers in so far as the section from the Drakensberg to the confluence of the Umzimkulu and Ibisi Rivers (about one-half of the border) was concerned; and to that extent the belt was accordingly withdrawn. The same reasons applied also to the portion of the border north of Alfred County; but as this section had not the advantage of a river frontage, it was deemed advisable to erect a double fence about 50 yards from the then existing fence along this extent (about 50 miles), and upon completion of the fence, in August, the 800 yards belt along this section also was withdrawn. Meanwhile, an inspection by the Resident Magistrate of Umzimkulu of portions of the fence along the Umzimkulu River indicated that the fence from the Drakensberg to the junction of the Umzimkulu and Ibisi Rivers needed overhauling. A competent officer of the Public Works Department was detailed to inspect the whole of that portion of the fence (170 miles). In some parts silt and rubbish had washed up against the fence to a height of 2 feet, thus lowering it to only 2½ feet. Extensive repairs were also recommended to place that section in the condition required to afford suitable protection against the introduction of cattle from Natal. Immediate steps were, therefore, taken to effect these repairs, at a cost of about £2,700, the

fence being at the same time heightened to 5 feet 6 inches in those parts where the configuration of the ground rendered a height of 4 feet 6 inches inadequate.

It had long been felt that for the proper protection of Pondoland it would be preferable to come to an arrangement with the Natal Government for the fencing of the Umzimkulu River from the point where it enters Natal territory to the sea, owing to the precipitous banks of the river and its affording a securer barrier than the Umtamvuna River, which is shallow and easily crossed. Alfred County, however, lies between these rivers, and if the Natal Government had agreed to the lower Umzimkulu being regarded, for East Coast Fever purposes, as the Cape Colonial-Natal boundary, restrictions as regards the movement of cattle between Alfred County and this Colony would have had to be relaxed.

A meeting was accordingly arranged of the Chief Veterinary Surgeon of this Colony and the Divisional Engineer of the Public Works Department at Kokstad with the officers of the Natal Government for inspecting the lower Umzimkulu, as a result of which it was found that from about November to the end of March it was impossible for cattle to cross the river, while during the remaining months of the year, when the river was not in flood, the cattle could not cross with safety except at two places. The expense of fencing the lower Umzimkulu was, therefore, not justified, and it was decided, for the present at any rate, simply to guard those drifts at which it would be possible for cattle to be brought into Alfred County from the remainder of Natal. One European and 30 Native Guards are being maintained *at the expense of the Cape Government*. At the same time the guards on the Pondoland border are being maintained at their full strength.

Restrictions.—The following are those at present in force:—

(*a*) From Natal no cattle, animal produce, grass, hay, reeds, rushes, herbs, plants (other than cultivated ones) or other vegetable matter can be introduced. Through Stanford's Drift and Union Bridge only vehicles and goods not prohibited which have been hauled all the way to the Border by equines from Donnybrook or Ixopo, as the case may be, are admitted. Through Riverside all live-stock other than cattle, sheep and goats, and all articles and things whereof the introduction is not specially prohibited and which are not conveyed in cattle trucks are admitted by rail only. This Port is also open for equine transport used solely for the conveyance of passengers and their personal effects. Ingeli and Harding Gates are open only for human beings and their personal effects and mail bags. Mail bags can only be brought through Middledrift, under the supervision of the Border Guard.

(*b*) From the Transvaal the introduction of cattle, grass, hay, reeds, rushes, cattle manure, and *green* hides, skins and horns is prohibited. Vehicles drawn by equines can cross the border at any gate, but those drawn to the border by cattle can only enter at Rooigrond and Mosymiyani after being outspanned on the Transvaal side, whence they are drawn across the border by mules. *Dry* hides, skins and horns have to be properly cured and dressed, and to be accompanied by a certificate by the Principal Veterinary Surgeon of the Transvaal to this effect. Wool and mohair must be properly baled and come direct to a railway station between Mafeking and Fourteen Streams for consignment to a port without being opened *en route*.

(*c*) From the Bechuanaland Protectorate the introduction of all cattle other than slaughter stock is prohibited, and slaughter stock have

to be dipped under supervision at Ramathlabama before they enter.

(*d*) From Rhodesia the introduction of cattle, grass, hay, reeds, rushes, and *green* hides, skins and horns is prohibited. *Dry* hides, skins and horns can enter only under the same conditions as in the case of the Transvaal

(*e*) From the coast north of Durban the introduction of cattle, sheep, goats, buffaloes and antelopes is prohibited.

The grazing or depasturing of any horned cattle on the land lying between the Ingwangwane, Indowana, Umzimkulu and Umtamvuna Rivers and the Border Fences is prohibited under penalty of immediate destruction without compensation, while the removal from the same area of grass, hay, rushes, reeds, herbs, plants and other vegetable matter liable to carry ticks is also prohibited.

The importation into or removal from place to place within the Transkeian Territories, with intent to spread East Coast Fever, of any animal or portion of the carcase of any animal or any articles or things which, either by contact with any affected animal or through any other means, are liable or capable or have been rendered capable of transmitting the disease is prohibited under a penalty of £500 or seven years' imprisonment, or both such fine and imprisonment

An Advisory Board, composed of Europeans and Natives, to assist the local Magistrate, has been formed at Umzimkulu This Board has been of considerable assistance to the Department, and has been the means of establishing a system of co-operation between the Government and the local people.

The following is an extract from a report furnished by the Chief Magistrate, Umtata, in September, 1908 —

"At meetings held by me with the Natives in Eastern Pondoland, at Bizana, Flagstaff, and Lusikisiki, I fully explained the nature of East Coast Fever and the means by which the disease was spread, and how its introduction could be prevented. I found a most excellent spirit prevailing; the people expressed their hearty thanks to the Government for the steps already taken to prevent the disease from entering the Territories from Natal. . . . The danger of infection being introduced arises from several causes First, there is the very natural desire on the part of Natives in Alfred County, Natal, who are Pondos or allied to that tribe, to remove their cattle as the disease approaches, and place them for greater safety with relatives and friends in Pondoland, and of Bacas and Hlangwenis in Natal endeavouring to remove cattle to their fellow tribesmen in the District of Umzimkulu. Against this I most strongly cautioned the Natives at all the meetings held by me. The second cause arises from the fact that cattle can be purchased very cheaply in Natal, more especially in the neighbourhood of infected areas, and there is always a danger of unscrupulous persons, for motives of gain, endeavouring to evade the regulations, and introduce cattle which in the Umzimkulu and Eastern Pondoland districts are in demand at fair prices for the purpose of cattle contracts in procuring labourers for the mines. This can only be prevented by the unfailing diligence and alertness of the Border guards and co-operation of the farmers and Natives. I am pleased to state that reports from all sources show that the whole of the border is being most carefully guarded, and men are alive to the very responsible nature

of their duty. The third source of danger arises from the use of oxen for transport purposes, but under existing conditions I do not advise any alterations.''

A deputation of Pondos accompanied by Veterinary Surgeon Spreull recently visited the scene of the latest outbreak in Natal, at Elim Mission Station, where they were fully impressed with the serious nature of the disease.

Eleven men have been specially appointed for the purpose of repairing any breaks which may occur in the fence along the Natal Border. These men move constantly up and down the fence, each taking a defined section, and at the same time do the duty of guards, while 84 additional Natives have been specially engaged to guard the drifts across the Umzimkulu and Umtavuna Rivers to prevent cattle being smuggled across at night. Twelve extra guards have also been engaged on the land boundary between the Ingeli and the junction of the Ibisi and Umzimkulu Rivers.

Depots have also been established at Riverside, Umzimkulu, Bizana and Port St John's, where an emergency stock of fencing materials has been stored to enable the Government to cope without delay with any outbreak, in the event of the disease crossing the Border.

A Veterinary Surgeon was specially detailed for examining outbreaks of disease on the border, both in this Colony and in Natal territory, for the purpose of ascertaining the nature of the disease, and arrangements have been made for conducting, with the consent of the Natal Government, experiments with the use of Trypan Blue in the infected location in the Lower Umzimkulu part of Alfred County.

Special legislation (Act No. 17 of 1908) has been passed giving full powers for dealing with any outbreak of East Coast Fever, and the Department is, therefore, in the position to take prompt measures should it unfortunately be necessary to do so.

The Government has determined to adopt a policy of clearing the Districts which border on Natal as far as possible of ticks, and, with this object in view, is adopting the following measures, viz :—

1. Dividing fences between the Lower Locations in the Umzimkulu District and the adjoining properties are being erected under the Fencing Acts as rapidly as possible.
2 A new fence is being erected from Fort Donald through Pondoland to the sea, in the event of the necessity hereafter arising for providing a further line of defence.
3 Arrangements are being made for the erection of twenty cattle dipping tanks on approved sites and 10 miles or less apart within which belt periodical dipping will be made compulsory as soon as the tanks are completed.
4. Stock inspection will be arranged for at Government expense.
5. Supervision of dipping will be provided and dip supplied (*a*) at cost of owners in European areas; (*b*) at cost of the Council in District Council areas, and (*c*) out of the proceeds of a special tax of 2s. 6d which will be re-imposed in non-Council Native areas.
6. The offer of monetary grants on the £ for £ principle in aid of the construction of cattle dipping tanks has been withdrawn, and is being superseded by a system of advancing loans from public funds subject to repayment with interest in annual instalments.

As a further precautionary measure, the District of Bizana has already been proclaimed a "suspected" district, from or into which the removal of any horned cattle is absolutely prohibited. Transport wagons and goods from adjoining districts of this Colony are only admitted through Nqabeni

Drift, where they are hauled across by a steel cable after the oxen drawing them have been outspanned on the Flagstaff side of the boundary. Sixty Native Guards under the charge of three C.M.R. have been engaged to guard all drifts where cattle may cross or be illicitly introduced, and to patrol the boundary, whilst the Headmen of the Border Locations are also being granted a small monthly allowance in consideration of their rendering similar assistance. Any cattle which may be introduced into the Bizana District from adjoining districts will be impounded by the Headman of the Location in which they are found and isolated as completely as circumstances permit pending an enquiry by the Resident Magistrate and instructions as to their disposal. It may be added that only human beings on foot with their personal effects are permitted to cross the Border from Bizana into Natal, and then only through Middledrift.

Cattle Dipping.

The Cattle Cleansing Act, No. 31 of 1908, may be taken as the first step in the direction of legislation for preventing the spread of ticks by the removal of cattle. The main provisions of the Act are that tick-infested cattle may not be on any main, divisional or municipal road, nor on any public outspan or commonage, unless they have been cleansed within 14 days, and they must be under the control of a competent person. This does not, however, apply to cattle of persons within the boundaries of their properties. Cattle on such a road or place may be inspected by a Field-Cornet, Justice of the Peace, Sheep Inspector or Police Officer, any of whom may demand to see the certificate required by the Act. These officers are also enjoined, if the certificate be not forthcoming, to cause the cattle to be cleaned at the cost of the owner.

By Proclamation No. 416 of 1909, the term "cleanse" is defined and the form of certificate required prescribed.

The Act has been proclaimed in force in the Divisions of East London, Bathurst, King William's Town, Komgha, Albany, Port Elizabeth, Fort Beaufort and Alexandria, and is being extended to the Cathcart, Victoria East and Peddie Divisions. It leaves Divisional Councils to decide whether it shall be enforced in their division or not.

Fair progress has been made in regard to the construction of cattle dipping tanks, which are distributed as follows:—

List of Public and Private Dipping Tanks.

District.	*Public Tanks.*	*Private Tanks.*
Albany ...	. Grahamstown	Mount View, Manly Flats, Jericho, Thorneycroft, Glen Boyd, Ballinafad, Southey's Hoek, Ashtondale, Ward Vale, Clay Pits, Frazer's Camp, Bucklands, Crosslands, Hebron, Sweet Kloof, Pleasant Prospect, Mount Pleasant, Woodlands, Middleton, Ellende, Schmit Kop, Woodberry, Retreat.
Alexandria ...	... Alexandria Commonage, Paterson Commonage, Graaff Water, Doornkloof.	Hopefield, Leeuwenbosch, Bushy Park, Hilary, Bluegum Villa, Sea View, De Grip, Thornhill.
Adelaide ...	... ...	Saxfold Park, Elandshoek.
Bathurst ...	... Round Hill Outspan, Brak River Outspan, Bathurst.	Greenfountain, Thornhill, Tharfield, Cuylerville, Rokeby Park, Summerhill Park, Kasouga West, Coombs.
Bedford ...	... Klipplaat	Bellevue, Cullendale.
Butterworth	... Butterworth Commonage.	...

District.	*Public Tanks.*	*Private Tanks.*
Cathcart	Cathcart	Thomas River, Waku Valley,, Middledrift, Ferndale, Rookin, Hopewell, Wellington, Cloete Dale.
East London	East Bank Location	Dreyer's Hoek, Prospect, Hillside, Elliottdale, Shelford, Ferndale, Amalinda, Farms 10 and 89 in Ward 5, Farms 154 and 113 in Ward 6, Gonubie Park, Lilyfontein.
Engcobo ...	Engcobo Commonage ..	Nil.
Fort Beaufort	Fort Beaufort, Yellow woods Outspan.	Baddaford, Olive Cliff, Septon Manor, Rocklands, Rietfontein, Clifton, Botha's Post.
George	George Town, Diepkloof, Woodville.	Nil.
King William's Town	King William's Town, Berlin Commonage, Keiskama Hoek, Welcomewood.	Gray's Drift, Gobongo Park, Gonubie, Mowbray Park, Sparkington, Izeli.
Knysna	Knysna, Eastbrook ...	Nil.
Komgha	Komgha Commonage ...	Lincoln, Kei Bridge, Stainland, Annexation, Mooi Plaats, Farm 267, Kwelera; Farm 292, Farm 287, Waterfall, Keikop, Ewanrigg, Lower Kuku, Lot 46, Westbury, Thorn Park, Denston.
Mount Currie	Hermon	Fairview.
Mqanduli ...	Mbozisa	Nil.
Nqamakwe ...	Blythswood	Nil.
Port Elizabeth	Port Elizabeth (in course of construction).	Bushy Park, Little Chelsea.
Peddie		Pera, Gola Poort, Dunstan, Wooldridge.
Stutterheim	Bolo Police Reserve	Cloverdale, Quetta, Wetherrun, Waterford Estate, Woodridge.
Uitenhage	Glen Connor ..	Cuyler Manor, Perseverance, Prentice Kraal, Maitland River, Coega's Kop, Tankatara, Aloes.
Umtata ...	Umtata	Nil.
Umzimkulu	Umzimkulu, Lourdes, Riverside.	Sneezewood.
Victoria East	Alice, Calderwood ...	Alandale, Witney, Nottingham.

In addition to the foregoing, cattle dipping tanks, which are available for use by the public, have been constructed by the District Councils in the following Districts of the Transkeian Territories, viz.:—Elliotdale (1), Engcobo (1), Idutwya (1), Kentani (3), Mqanduli (2), Qumbu (1), Tsolo (1), Umtata (3), Umzimkulu (2) and Willowmore (1), while two tanks are being constructed in the Mount Ayliff District.

In Pondoland 16 tanks have been completed, distributed as follows: Bizana, Libode and Ngqeleni, 3 each; Flagstaff, Lusikisiki and Tabankulu, 2 each; and Port St. John's, 1.

For dipping in the districts in the Native Territories under the Transkeian General Council funds to the extent of £1,000 were provided by the Council for the financial year 1908—1909, in order to popularise the practice of periodically dipping large stock, while the Natives have already been and continue to be urged by Government officers in the Territories to take advantage of the facilities provided for cleansing their cattle.

In several instances the firm of Messrs. McDougall Bros. has been undertaking the trial dipping and instructing the Council's employés, while in Tembuland and the Transkei results of previous dipping are said to be steadily making favourable impression, and to be the means of spreading the desire for it.

The question of supervising dipping operations in Pondoland, where the difficulties are far greater, is at present under consideration.

THE MALLY FRUIT FLY REMEDY.

FOR THE PREVENTION OF MAGGOTS IN APRICOTS, PEACHES, APPLES, PEARS, ORANGES, AND OTHER FRUITS BY THE DESTRUCTION OF THE PARENT FLIES BEFORE EGGS ARE LAID.

On the creation of the post of Eastern Province Entomologist in 1903, the incumbent, Mr C W Mally, was instructed to give special attention to the Fruit Fly (*Ceratitis capitata*) pest In the following year Mr. Mally reported (see *Agricultural Journal* for December, 1904), on the probable value of an entirely novel preventive measure, that of destroying the adult flies by a very light sprinkling of a poisoned sweet over the trees. He told of some very encouraging preliminary trials he had made, and recommended those who were in a position to do so to test the method on their own account The public, however, did not take at once to the remedy, and various obstacles interfered with Mr. Mally making a striking demonstration of its value until last season Then, as reported in the *Agricultural Journal* for June, 1909, he succeeded in proving its worth in a way that should convince the most sceptical. A severe outbreak of the pest in a commercial peach orchard was brought to a sudden and practically complete halt, and the fruit maturing later was marketed under the guarantee of freedom from maggots. The infestation of the fruit on the treated trees fell from over 50 per cent. to less than 1 per cent., while that of untreated trees a few hundred yards away increased until practically every fruit was involved

The remedy is a simple one, and its application requires no expensive equipment. Mr. Mally has given considerable time to devising and experimenting with special attachments for spray pumps to facilitate the sprinkling, but ingenious and practicable as several of his perfected contrivances are, he has abandoned them all in favour of the common form of brass garden syringe which every gardener can afford to purchase and which every hardware merchant can afford to stock.

The spray fluid admits of much variation in its ingredients, but Mr. Mally recommends :—

		Or
Sugar	2½ lbs.	25 lbs.
Paste Arsenate of Lead	3 ozs.	2 lbs.
Water	4 gallons.	40 gallons.

These are quantities convenient for a paraffine oil tin and a barrel. The arsenate of lead should be mixed with a small quantity of water, and then stirred into the bulk. The very cheapest sugar serves the purpose as well or better than the best, and treacle would be preferable to sugar were it as easy to handle. Honey and pineapple juice were found by Mr. Mally to be more attractive to the flies than sugar or treacle, but the use of the

former is inadvisable because attractive to bees as well as flies, and the use of the latter is impracticable for most people because of the difficulty in obtaining supplies The proportion of arsenate of lead is more than ample to ensure the death of flies that take the bait, and is about as much as can be used with safety to the foliage of peach trees Made as recommended, the poison seems not to be taken by bees but houseflies and many other flies, succumb to its influence

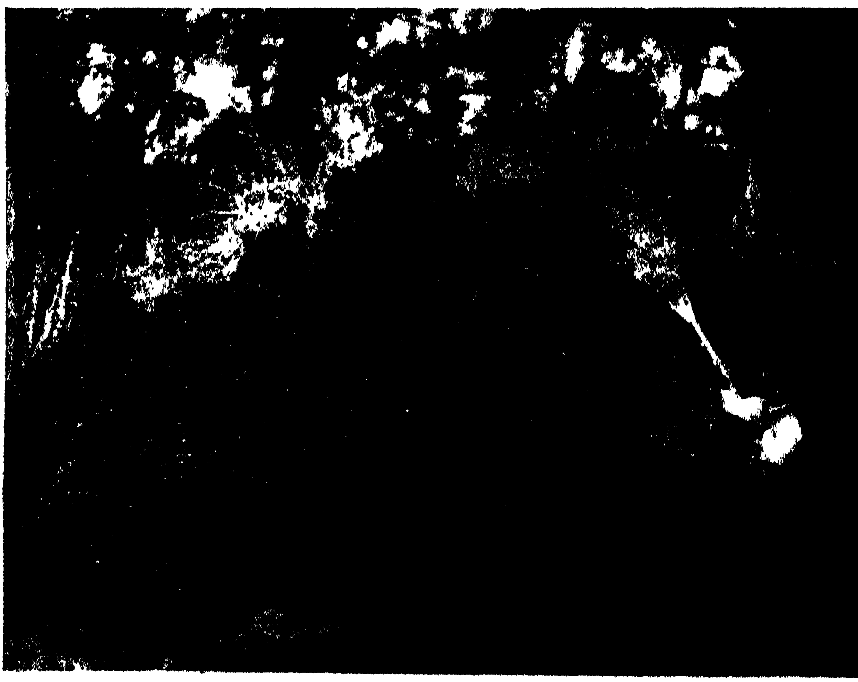
One of the accompanying figures illustrates a complete equipment for treating a small orchard,—a tin of arsenate of lead and a pocket of sugar, a barrel of water, an improvised pail to carry poison by hand from tree to tree, and a suitable syringe Such a syringe as is shown may be bought for about 12s 6d

COMPLETE EQUIPMENT FOR MALLY FRUIT FLY REMEDY WORK—Arsenate of lead and sugar with barrel in which to mix same with water, improvised pail to carry poison into orchard; syringe for squirting mixture over the trees

The second figure shows a man applying the poison to an orange tree The finest spray the syringe can produce should be used and only *a very small quantity* applied A pint to a pint and a half is sufficient for a good sized ten-year-old peach tree and more in proportion should not be put on any tree. It is particularly important not to overspray peach trees owing to their extreme liability to injury The man should walk around the tree, keeping two or more yards away, and should distribute

the spray in a series of short squirts directed so that the liquid will fall in innumerable small drops over and through the tree, and with no more in one part than another. A single fill of the syringe will often be enough for one tree, and thus the man be back to the starting place by the time the syringe is emptied. The mixture should be stirred before each filling of the syringe in order to ensure uniformity of strength.

The number of applications necessary to protect a crop will vary with local conditions and with the season. The aim should be to have the poison present as long as there are fruit flies about to take it. Rain will dissolve and wash the sweet ingredient off, and the bait should be renewed as soon as the weather appears to have settled after every rain in the fly season. The first application should be made a full month before the presence of maggots in the fruit is ordinarily expected, and after that an application after the expiration of every ten to fourteen days is thought



Application of Mally Fruit Fly Remedy.—One syringeful applied in a series of squirts as the operator walks around answered for a fair sized tree.

advisable. There is no necessity of sprinkling the fruit itself, and as far as practicable getting any of the spray on the fruit should be avoided. Sprinkling for the purpose of killing the Fruit Fly is thus very different to spraying for Codling Moth. If some maggots are usually found in the apricots, sprinkling had best be started when the early sorts are about half grown, say about the middle of November. Very likely a single application every three or four weeks will suffice after the New Year, if there has been a succession of successful early treatments and if close neighbours have been likewise careful, especially if there has been reasonable care to collect and destroy any fallen fruit. Wild fruit plants in and around a garden, as say prickly pear, passion plant, and blackberry, had best be treated when they bear any ripe or decaying fruit which might serve the flies as food.

It is most necessary to treat the stone fruits, that is the apricots, peaches, nectarines and plums, to get exemption from maggots; but in many orchards and gardens, pears, apples, quinces, and oranges are also much attacked and should be sprinkled in their season. It is not often that any fruit is attacked until it is half to two-thirds grown, and only the early peaches and apricots need be treated in November and early December. Experience only will teach one the minimum number of times which he can safely trust to yield satisfactory results. But, however often it may be necessary to spray, it now seems assured that the careful gardener and fruit-grower need no longer fear the loss of his fruit by the Fruit Fly.

There is likely to be a shortage of arsenate of lead in the Colony during the present season, but as the demand for the article increases and becomes more constant, annoyance from this source will become less and less frequent. Importers at present are afraid of laying in large stocks because the demand is erratic and because many firms are engaging in the trade that never imported any before When in wooden kegs, as is usual, the paste is apt to cake and become hard if held from one season to another. Would-be purchasers are recommended to endeavour to get supplies from local firms if only to encourage those firms to lay in a stock Paste arsenate of a thoroughly reliable brand should be demanded

FRUIT EXPORT.

Return of Fruit Shipped from Cape Colony during September, 1909

Port of Shipment.	Destination.	No. of Packages.	Description of Fruit.	Quantities.	Value. £ s. d.
Cape Town ...	England	120	Oranges ...	15,990	44 13 0
" ...	"	62	Naartjes ...	1,240	3 2 0
" ...	" ...	1	Lemons ...	20	0 2 0
" ..	St. Helena .	10	Oranges ...	1,239	3 0 0
" ...	"	3	Naartjes ...	500	1 5 0
" ...	German South West Africa	146	Apples ...	17,540	64 16 6
" ...	"	2	Guavas ...	250	0 8 0
" ...	"	32	Bananas ...	24,000	27 13 9
" ...	"	25	Lemons ...	3,040	5 7 9
" ...	"	55	Naartjes ...	5,090	10 8 3
" ...	"	304	Oranges ...	38,586	99 15 4
" ...	"	13	Pine Apples...	460	6 3 6
Port Elizabeth	England	201	Oranges ...	5,806	50 5 0

BILIARY FEVER OR MALIGNANT JAUNDICE OF THE DOG (CANINE PIROPLASMOSIS).

FURTHER NOTES ON THE DRUG TREATMENT.

By WALTER JOWETT, F.R.C.V.S., D.V.H., Veterinary Department, Cape Town.

The last issue of the *Agricultural Journal* contained a report on certain experiments carried out at Rosebank Experimental Station in connection with a newly introduced treatment for the above-mentioned disease.

Judging from the numerous queries which have since been addressed to the writer, it appears that the general method of carrying out the treatment as described in our former article was not made sufficiently clear; it seems desirable, therefore, to recapitulate and to amplify this part of the subject. Since the last report was issued we have treated several other dogs—naturally infected as well as experimental cases. These we are pleased to say, with two exceptions—one far advanced and hopeless from the commencement, the other will be referred to presently—recovered after one injection of Trypan blau in appropriate dosage. We can but repeat the statement contained in the previous article, viz., that the Trypan blau treatment for this disease (canine biliary fever) for the knowledge of which we are indebted to the researches of Prof. Nuttall and Dr. Hadwen has, in our hands, proved an unqualified success. It has in fact more than realised all our expectations.

Most of the questions which have been raised have had reference to one or other of the following points:—

1. The nature, cost, and appearance of Trypan blau.
2. The mode of preparation of solutions used for therapeutic pur poses—that is for injection either into a vein or under the skin; and
3. The general procedure in injecting the dye, the dosage, and the number of doses to be given.

In this short note we will endeavour to briefly answer these questions.

I.—The Nature, Cost, and Appearance of Trypan blau.—Trypan blau is one of the newly introduced Benzidine colours; in appearance it is a dark coloured (violet or black) somewhat coarse powder, soluble—though not to any considerable extent—in both hot and cold water. Its solubility is, naturally, greater in the case of the former as compared with the latter.

Regarding cost we are unable to quote precise figures, but the drug is comparatively inexpensive.

II. The Mode of Preparing Solutions for Injection.—In our early experiments the proportion of dye to water used was three per cent. This was prepared with boiling distilled water and injected at blood heat. We did not filter the solution, and in the process of cooling a considerable quantity of the dye separated out, forming a sediment. Consequently when drawing up the liquid into the syringe for injection purposes, we took up also some of the sediment. This, we decided later, was undesirable. Much of the intense local reaction which followed the injection of the unfiltered liquid under the skin we attributed to the presence of this undissolved dye or sediment therein Moreover, it was found that a 2 per cent. solution answered all requirements, and now this is the strongest solution we use. In the proportion of 2 per cent. Trypan blau dissolves in boiling water, but a certain proportion separates out on cooling. This can be removed by filtration. The filtered fluid, we consider, gives much more satisfactory results; true, when introduced under the skin in large quantities it produces some local reaction in the nature of a swelling. This, however, is not nearly so large or so troublesome as that following the injection of an *unfiltered* two per cent. or stronger preparation. For small animals and puppies a one per cent. solution is still used as heretofore. This we do not filter. For intravenous injection we now use likewise a two per cent. solution *after filtration*

In preparing say one hundred cubic centimetres of Trypan blau solution for injection—we proceed as follows:—

1.—First we weigh out 2 grammes of the powder Trypan blau, and place this in a perfectly clean vessel (glass beaker).

2.—Next we add to the powder one hundred cubic centimetres of boiling distilled water (about 9 grains to the fluid ounce would form a 2 per cent. solution).

3.—After cooling, this is filtered through a funnel containing a filter paper suitably folded, the filtrate being received into a glass measure or beaker. This furnishes the material for injection.

All our apparatus is boiled (to sterilise it) prior to use, or the filtrate is afterwards brought to the boiling point and allowed to cool again before being injected.

III.—The general procedure in injecting the dye is as follows:—

One uses, of course, a suitable hypodermic needle and syringe, and these, prior to being used, are placed in a pan containing cold water, which is placed on a stove, and both syringe and needle are boiled for ten minutes or so in order to sterilise them. After cooling the approximate quantity of a solution of Trypan blau is drawn up into the syringe, and the needle, either separately or attached to the syringe, is introduced under the patient's skin, or directly into a vein, as the case may be. By pressing gently on the piston of the syringe the dose is introduced. After withdrawing the needle and syringe the operation is completed.

Regarding the *Site of Injection*, when introducing the solution merely under the skin, one usually injects it in the chest wall, behind the shoulder, or on the under surface of the abdomen (belly). A fold of skin is pinched up with the left hand, and the needle introduced with the right. One usually clips a small patch of hair from the selected site and washes the area with a disinfectant prior to introducing the needle.

The operation then is simple. Nevertheless, it requires a certain amount of skill and care, and wherever the services of a duly qualified Veterinary Surgeon are available, it would be unwise for the layman to undertake the treatment. In many parts of the Colony, of course, it is impossible for one to obtain the services of a Veterinary Surgeon, and it is

for the benefit of persons living in such districts that the above brief instructions have been written We repeat that the necessity of this course has been made manifest by the numerous queries which have been addressed to us during the past few weeks.

In regard to dosage, the following are approximately the doses we have administered.

Puppies of two months old and of 3 to 5 lbs weight received 3 to 4 cc of a 1 per cent. solution

An adult nondescript (9 lbs.) received 3 to 5 cc of a saturated solution

Terriers of from 11 to 20 lbs received from 4 to 6 cc of a saturated solution.

Dogs of from 20 to 30 lbs, 6 to 10 cc of a saturated solution.

Dogs of from 30 to 40 lbs, 10 to 15 cc of a saturated solution.

Two dogs, one a retriever, the other a sheep dog, each weighing 59 lbs, each received 20 cc. of a saturated solution

A Newfoundland of 65 lbs weight received 25 cc of a saturated solution

Regarding the Number of Doses to be Administered.—One full dose should suffice. This will cause the parasites to disappear from the blood. True they may reappear therein some days afterwards in sufficiently large numbers to be demonstrable on microscopical examination, but in most instances the second invasion seems to occasion no visible ill effect to the host; certainly the body temperature may be elevated in consequence of it, but as a rule, the animal remains to all appearance in good health and continues on the road to recovery.

Occasionally, however, the reappearance of the parasites in the blood in considerable numbers brings about a relapse, and as Nuttall and Hadwen have already remarked, "When a relapse occurs in a dog which has been previously treated, a second dose of Trypan blau seems to exert no influence on the parasites."

One of our patients in which a relapse occurred twelve days after treatment, fully bears out this statement—this is one of the two animals referred to in the first part of the present note. In this case, although the first dose of Trypan blau caused the parasites to disappear from the blood, they reappeared therein after some days, producing a serious relapse in the animal's condition. A second dose now administered (twelve days after the first) although intensifying the blue colouration of the tissues, yet seemed to exert but slight, if any, action on the parasites, which remained in quite considerable numbers in the blood. Later, however, they became less numerous, and at the time of writing the animal appears to be progressing slowly towards recovery

One must administer, then, a full dose of the drug at the commencement of the treatment. This, combined with suitable dieting and nursing, will suffice in the majority of cases to effect a speedy and satisfactory cure.

THE CODLING MOTH.

[The following popular account of the Codling Moth was recently written by the Government Entomologist for publication in Eastern Province newspapers. Almost the whole of it, however, is applicable to the entire Colony, and as it is over ten years since the life story of the insect and the details of remedies for it have been told in the *Journal*, it has been deemed advisable to publish it in these pages for general information]

The term "Codling Moth" is the generally accepted popular name for an insect which in its caterpillar stage is the most important insect pest of apple and pear fruits. It became established in the Midlands of Cape Colony prior to 1893, and about Cape Town and Stellenbosch prior to 1897. Until about 1900, however, it was not widespread in the country. Now few districts of the Colony are free of it, and it has spread north into, or otherwise become established in, Bechuanaland, Transvaal and Orange River Colony

THE PROTECTION OF EASTERN DISTRICTS

To retard its spread into the south-eastern part of the Cape Colony, the Government has, since 1905, prohibited the introduction into that area from anywhere of apples, pears and quinces, and cases, etc., which have contained the same. The prohibition has been as fully enforced as has been practicable, but it is inevitable that the pest get into all apple and pear growing parts of the protected area sooner or later,—if not by accidental introduction then through its slow spread from farm to farm. It was discovered at Queenstown, well within the area, in February 1906, and the fact announced at the Farmers' Congress being held in the town at the time. Probably it had become established in Queenstown before that market was closed to Western Province fruit. Some time later the Department of Agriculture proposed that Queenstown district with all parts north be omitted from the protected area, as it deemed this step desirable in the interests of the districts further to the south It was felt that the pest would soon spread from the town into the surrounding country and therefore that the retention of Queenstown district amongst uninfested districts was a distinct menace to the latter. The Eastern Province Horticultural Board, however, strongly disapproved of removing the district from the protected area. In consequence it was left in, but to lessen the risk to the lower districts the removal of the fruits concerned from Queenstown and its immediate vicinity was prohibited. As matters have since stood, Queenstown can receive apples, pears and quinces only from within the limited protected area, and is prohibited from sending any of these fruits away The Department of Agriculture is still prepared to contract the protected section of the Colony, so as to have the southern border of Queenstown district adopted as its outer limit, if the Eastern Province Board of Horticulture withdraws its objections; and it fears that lack of this action when it was proposed may already have led to the spread of the pest far to the south. Farms well outside of the town zone are stated by persons competent to know to have become badly infested. There are now grave reasons for suspecting that the pest has reached King William's Town, whence it could easily have got with fruit from infested Queenstown farms quite legitimately taken there. It may, of course, have got there, if

there it is, in some other way. The residents of both Queenstown and King William's Town should now be interested in the insect, and these notes are written expressly for their information As with other moths, and insects in general, there are four well marked life stages - egg, larva, pupa, and adult insect All the damage is done by the larva

The Adult Insect

The adult Codling Moth is seldom seen It flies chiefly in the evening, and rarely of its own accord does it enter a house Lights and sweets are not attractive to it as they are to many moths Across its outstretched wings it measures only about three quarters of an inch The fore wing is crossed with dark and pale bands of scales, giving a greyish effect, and towards the tips there is a large patch of scales that are bronze-like in colour In Cape Colony there appears to be everywhere two broods of moths

Apple showing damage by Codling Moth

in the year, one most numerous during late October and early November and the other most numerous in late December and January. A third brood probably occurs in most places, but the several broods overlap to such an extent that they cannot be fully separated Some moths are about throughout the whole season for pears after the earliest trees bloom.

The Egg.

The egg also is seldom seen It is a whitish scale-like object about a twentieth of an inch across. Those laid after the fruit is large are probably laid, as a rule, on the fruit but early in the season many are laid on the leaves and young twigs Up to a hundred is said to be laid by a moth but the number, as a rule, is thought to be between thirty and forty. The stage lasts from about nine to about eighteen days, usually about eleven days.

The Larva.

The larva is the business stage of the insect. It is not long in finding its way into the fruit. It usually begins to tunnel its way inward from the blossom end, but entrance is also effected from the side of the young fruit, particularly at a point of contact with a leaf or another fruit. Some of the excrement is forced out through the entrance aperture, a mass of it usually adhering about this place and thus serving as an index to the work of destruction taking place within. The fruit often falls before the larva has left it; and in such a case, the larva, on making its escape, generally crawls to the trunk of the tree If the fruit remains attached, the larva descends by the thread it spins or else crawls back to the branch and thus to the trunk.

The full grown larva is a plump, flesh-coloured or pinkish caterpillar measuring about three-fourths of an inch in length. The presence of legs,—of which it possesses the three pairs of jointed ones characteristic of insects and in addition the five pairs of fleshy, jointless ones borne by most caterpillars,—serves to at once distinguish it from the maggot of the fruit fly, with which many people confuse it. Full growth is reached in two to four weeks. The average specimen takes about twenty days.

The Cocoon and Pupa.

When full grown the larva seeks a place for concealment and there spins a white, silken cocoon. The trunks of old trees generally abound in suitable locations, and it is under a loose piece of bark or in a hole in the tree that the cocoons are usually found. The habit of the insect is to hibernate in the larval stage, and hence, if the larva becomes full grown late in the season, it generally remains unchanged through the winter. If it is destined to become a moth the same season, the larva sheds its skin within a few days and becomes a pupa, and after remaining in this stage for a few weeks the transformation to the winged insect is complete. The period has varied under observation from eleven to forty-nine days, and is usually about twenty-two days. This makes the average life cycle for a summer bred specimen about two months long If the bark of the tree is smooth and free of holes, the larvae are likely to spin their cocoons in the ground. The junction of the trunk with the soil is a favourite place.

Extent of Damage.

The percentage of fruit that gets infested with Codling Moth varies with the season and with the variety, but to nothing like the extent as with the Fruit Fly. Exceptionally, every fruit on a large apple or pear tree may get infested, but an all round infestation at picking time of about fifty per cent. of apples and pears is probably about the average extent where the insect is thoroughly established and where no steps are taken to combat it. Quinces in some places get very much infested while in others they are almost exempt from attack. Peaches, plums and apricots may all get infested to a slight extent, but these fruits generally decay or are consumed before the larvae can mature. Excepting in the case of late peaches perhaps, few infested stone-fruits leave the orchard, and late peaches are little attacked unless grown near apples or pears. Walnuts are attacked even more than the stone-fruits.

Effect on the Fruit.

The effect of Codling Moth attack on the fruit naturally varies with the size and condition of the fruit when the work is in progress, and with the variety. If attacked very young it often drops from the trees while still small and hard. When attacked at a somewhat later stage—though

still hard and green, the fruit develops despite of the infestation but often fails to attain full size since the injury may cause it to ripen prematurely. The larva generally seeks the core of the fruit and seems specially fond of the seeds. The entrance is usually from the blossom end or where the fruit touches another fruit or a leaf or where there is some depression. A favourite place in some varieties of pears is the deep crease near the stem end.

The fruit which falls while hard and green is almost wholly worthless. That which ripens, while almost unsaleable in first-class markets, is not wholly a loss. It is worth something as a food for stock. It is also worth something for cooking, and that least injured for eating uncooked. However, a great deal of this fruit will keep but a short time, if at all; much of it starts to decay before it leaves the orchard. That which gets infested very late may be little injured but, of course, it is not relished as table fruit by the fastidious. Much infested fruit is "evaporated" but the contaminated parts must all be cut away by hand and the resulting product is not strictly first-class owing to the varying shapes of the pieces. For similar reasons infested fruit is disliked for canning purposes.

How it Spreads.

Infested fruit and cases which have held infested fruit have been the means of carrying the Codling Moth from orchard to orchard and from country to country. Unless the fruit is very carefully picked over, infested fruit is almost certain to be sent away in every package of apples and pears despatched from orchards in which the pest is established The larvae may complete their growth before the fruit is consumed, and, leaving the scene of their revels, make their cocoons in the crevices of the packing case. The emptied case is, perhaps, thoughtlessly thrown aside and the insects left to complete their transformation undisturbed. Ultimately they emerge and continue the customary work of their kind,—not at all unlikely, nowadays, in a place distant hundreds or thousands of miles from the scene of their parents' operations. This is the way the insect has been spread over a large part of South Africa in the course of the last fifteen years.

Locally the spread of the insect is due largely to its winged stage, the moth. How far the moth can fly has never been determined, but the appearance of the insect on lonely Karroo farms, despite of alleged care to avoid the introduction of infested fruit, suggests that it may fly or be blown for several miles. There seems no reason to doubt that spread by this means alone is quite sufficient to get the insect established all over the country other than the very thinly settled middle and northern parts. Outward spread from Cradock, Aliwal North and Burghersdorp, Queenstown, and King William's Town must unavoidably establish the insect throughout the eastern part of the Colony. But spread in this way is necessarily slow, and hence the value of the prohibition on the introduction of the kinds of fruits most attacked into the area thought to be practically free of the insect.

Preventives.

When the Codling Moth once becomes established on a place, it is usually there to stay; in few places where it has intruded has it been altogether suppressed, and then only by the most heroic measures. Its introduction, therefore, means that continual warfare must be waged against it at considerable trouble and expense or else that losses far above this expense must be borne. For this reason, every farmer should guard against bringing the pest to his premises if the place is still free of it. Even if he has so few trees that its ravages would not be a matter of consequence to him, his neglect may aid its progress to some neighbour's orchard where greater interests are at stake. It is best that he abstain from bringing any

apples, pears or quinces from an infested place. If he brings them, he should keep them in the original cases until they are consumed and then he should promptly burn the cases. If he sells fruit he should avoid "returned empties." This applies even to cases which were sent from his own farm, for at the market they may have been stacked in close proximity to infested fruit. When they leave the fruit, the larvae may roam many feet seeking a place in which to secrete themselves.

Remedies.

At the public meeting at Queenstown on September 27th, the Eastern Province Horticultural Board requested the residents to scrape, band, and spray their trees. It had two objects in view,—to enable the townpeople to save their fruit, and to decrease the chances of moths spreading to surrounding farms and of infested fruit, removed in ignorance or defiance of the existing prohibition, being taken into clean parts.

The utility of the several measures advocated is apparent from the habits of the insect. The banding is to give the larvae a place on the trunk of the tree where they may hide but where they may be conveniently sought for and destroyed. The scraping of the trees is to remove the rough useless bark in order that the larvæ may not hide under it. The scrapings should be burned as they may contain larvae, and all holes in the trees should be choked so that larvae cannot get in or out of them. The spraying is to poison the larvae that seek to enter the fruit.

Spraying.

The spraying materials used successfully for Codling Moth are all arsenical poisons. The chief desirable features of a poison for such use are that it kills the insect, that it does not injure the tree, that it adheres well and forms a more or less uniform coating, that it sprays well, and that it is cheap. Arsenate of lead, properly made for use on trees, combines more advantages than any other poison for the purpose now on the market. If it is not made specially with a view to having it possess the qualifications specified above, it may be a poor insecticide and yet arsenate of lead from the chemist's standpoint. The same may be said of Paris green, but not to the same extent. Brands which are of thoroughly proved reliability in this country should be given preference: Swift's and Disparene are such. After them should come brands which have the endorsement of leading horticultural authorities—not merely of private parties. The Vreeland and Eagle makes are commendable. All mentioned are made in America. Until recently very little was manufactured elsewhere but amongst the several British brands lately put on the market there may be some quite as good as the best. The best now made are not allowed to dry in the course of manufacture and are sold in paste form for the simple reason that if the preparation be dried and powdered in any ordinary way, it settles more quickly in the spray tank and will not adhere nearly so well to the fruit. It does not seem probable that a powder which will be as good as properly made paste will ever be produced commercially, but efforts in this direction continue to be made. It is clear that at present it is best that powdered arsenate of lead should be avoided for Codling Moth spraying. It may answer almost as well for fruit fly work as in that case the poison is only of use so long as the film of sugar lasts, but it is well to keep on the safe side and use a thoroughly reliable paste. If arsenate of lead cannot be obtained, Paris green should be taken; or if that too is not procurable one can make up a poison from arsenite of soda, or white arsenic and soda, and lime. Particulars are given in the "Remedies" sheet issued gratis by the Department of Agriculture.

The Pump.

A spray pump is necessary to get good results in combating Codling Moth. A syringe is very inferior. The more powerful the pump, up to say one delivering the liquid under 200 lbs. pressure, the better, and a barrel pump working at say 40 lbs. pressure gives decidedly better results than a knapsack or "bucket" pump. But thoroughness of application at the right time and in the proper way is of more importance than the pump, and of necessity most spraying in small gardens must be done, if done at all, with a small, cheap pump. Therefore the man for whom a big pump is out of the question should get a small one, such for instance as the kind being used by the thousand for locust destruction. As a rule it is better to have a small pump of one's own that will be used at the right time than to depend upon a co-operatively owned large pump that may chance to be engaged when most wanted. Nozzles of the Bordeaux type, set to throw a fine spray, are the best to use with large pumps. With small pumps Vermorel nozzles are safer in inexperienced hands but they cannot give so hard a spray.

The First Spraying.

The first spraying is the one that counts most if done anything like properly. It should be applied immediately after the blossoms are off. Poison applied to the blossoms is liable to be taken by honey bees and to be practically wasted so far as the Codling Moth is concerned, but if the blossoming is very irregular or the number of trees large some blossoms must be ignored. Similarly the very earliest-set fruit may have to be ignored too. Varieties which do not blossom together cannot be given a proper first spraying together. The aim should be to coat the newly formed fruits thoroughly so that no larvae can enter them without eating through a film of poison. As already stated the chief point of attack is the blossom end and this should be the place for special attention. Poison should be forced into it by hard spraying directed straight at it. A mist-like spray all over the tree will do a lot of good but experience of recent years has proved that, using arsenate of lead, much better results come of driving the first spray hard, but finely broken, at the ends of the young fruits. The nozzle has to be taken close to the fruit and to this end a long hose and a pole, or a metal spray-rod to the end of which the nozzle is fixed, is generally indispensable. The rod is the better contrivance. To hit the fruit full at its top the nozzle must be set to deliver the spray at an angle to the rod, not in line with it, and to get the angle the top of the rod must be curved to about 45 degrees or an elbow to take the nozzle fitted to it.

Later Sprayings.

Later spraying are necessary in South Africa to make up for the deficiences of the first. It is customary to apply a second ten days or a fortnight after the first to coat any late setting fruits and to make more certain that the rest are well protected. If the conditions with regard to the first were ideal, this supplementary treatment can be omitted. Thereafter some orchardists like to spray every three or four weeks through the season, but when the early spraying is thoroughly done the economy of spraying again before the second brood of moths begins to appear is doubtful. Arsenate of lead adheres tenaciously, and when a good brand of it is used it is much less needful to give supplementary sprayings than when Paris green is the poison. However those who wish to keep well on the safe side had best give a third spraying about six weeks after the first.

The second brood of the insect, under Cape conditions, often does as

much or more damage than the first, and consequently requires attention. It is said that in the west of America the first brood may be so completely suppressed by a single timely spraying that the second is too small to be worth spraying for, but so far such good results are not attained in the Colony. At least one thorough spraying against the second brood seems desirable. It should be applied about the time the moths are emerging freely, which will be three to four weeks after the larvae of the first brood begin to enter the bands. The date will vary with the place and season, but ordinarily will be in early January. Very late fruit may be better for still another spraying, about six weeks later, if the pest is abundant.

Dilution of Poison.

Makers of arsenate of lead usually recommend that it be mixed with water in the proportion of 3lbs. to 50 gallons, and most Western Province fruit growers use it at this strength or else at the rate of 10 lbs. to 200 gallons. When freely and thoroughly applied with large pumps, American experience has shown that a mixture of 1 lb. to 50 gallons is strong enough to get the best results; but for work with small pumps and in inexperienced hands better results should follow the use of a greater strength. The practice of using 2½ lbs. to 50 gallons for the first spraying and 1½ lbs. to 50 gallons for later sprayings is recommended by the Government Entomologist.

Chemical analysis has shown that the poison lodged on fruit, even when 3 lbs. to 50 gallons is heavily applied, is insufficient to menace the health of anyone eating it. Several hundred fruits would have to be consumed at once, skin and all, to get what is considered a fatal dose of arsenic. Nevertheless all traces of the poison should be wiped from the rind before fruit is consumed or sold. Arsenate of lead shows as a whitish stain.

One pound of Paris green should be used with 150 to 200 gallons of water. The poison should be worked to a paste with a small quantity and then gradually stirred into the bulk of water. Owing to the danger of scorching the foliage and fruit, Paris green cannot be used at the great relative strength safe in the case of arsenate of lead, but one pound of it contains as much arsenic as about four and one-half pounds of ordinary paste arsenate. Some kinds of pears are injured by the one pound to 150 gallon strength. Both Paris green and lead arsenate should be kept thoroughly mixed with the water in the spray tank whilst spraying is going on; the former requires much stirring and the latter little.

Banding.

The habit of the Codling Moth larva generally to pass part of its time on the trunk of the tree suggested the idea that, by providing it with an easily examined shelter, it might be readily found and destroyed. Of the various devices that have been used as such "traps," bands of cloth about the trunks have proved to be the most serviceable. Pieces of heavy hessian, bagging, or old carpet make excellent bands, and best, perhaps, when cut in strips about eight inches wide and fastened around the trunk by a cord about the middle or by a small headed wire nail driven into the wood or used as a pin. A short piece of wire bent to form a hook at each end also makes a good fastener. The upper half of the band is turned down after adjusting the fastening and left hanging loose enough for the insect to easily crawl up in to the fold. To induce the larva to take shelter in the band, all loose bark should be removed and all cavities securely stopped with cement or other lasting material. Banding alone does not suffice as a remedy, and is of little importance compared with

spraying. But some larvae escape being poisoned, and a large proportion of these, about half it has been found, go into a band under favourable conditions. Many Cape fruit growers now practise banding and believe that it pays them well; and moreover they feel a certain satisfaction in having the larvae found and despatched. The bands should be applied towards the end of November, and examined regularly for larvae and pupae once in ten to fourteen days until after the fruit is gathered, or so long as any new arrivals are found. If the intervals between examinations are too long, empty pupa shells will be found in the bands, showing that some of the insects have had time to change to moths; and if needlessly short most of the insects will be found as larvae. No general examination need be made until an examination of the bands on a few of the worst infested trees shows that the larvae are entering. If the bands are left on through the winter they should be examined in early September to get any larvae which may have crawled up from the ground during the winter. If the ground was not disturbed in the winter, they should be examined again a few days after it is dug over in the spring.

The hand-picking, at fortnightly intervals, of the fruit that can be seen to be infested, by the castings thrown out by the larva, may be easily conducted in very young orchards, and thus the necessity for banding obviated. Amongst larger trees, the frequent gathering and effective disposal of windfall fruit is of some importance, as much of such fruit contains larvae when it falls, and these, if left, have a good chance of pupating in the soil.

Success of Spraying.

Large numbers of Western Province fruit-growers can be found who will testify that through the help of spraying they are able to harvest upwards of ninety per cent. of apples and upwards of ninety-five per cent. of their pears free of Codling Moth. Some claim much better results and others acknowledge inferior ones. In many carefully conducted official tests in America upwards of ninety-five per cent. of sound apples have been obtained by three sprayings when control trees have yielded only twelve to twenty-five per cent. of sound fruit. In some places where spraying by power machines is practised, the losses are said to be under two per cent.

There is abundant evidence to show that careful spraying will ensure an almost clean crop, however near unsprayed trees may stand.

Rows of sprayed trees in orchards have yielded ninety-five to ninety-nine per cent. of clean fruit, whilst seventy-five per cent. of the crop of adjoining unsprayed rows has been infested. It follows that so far as spraying for the Codling Moth is concerned, a man need not worry himself over lack of action on the part of neighbours. The writer visited French Hoek to observe the success of spraying last year, and the cleanest orchard he found was only a stone's throw from the foulest. One had been carefully sprayed and the other left unsprayed.

Frontier Action Wanted.

About Aliwal North, Burghersdorp and Queenstown, and wherever else the pest is well established, the residents should practise banding and spraying as described above. The suspicion that the pest is at King William's Town rests on one resident having found half a dozen pears infested by what he believed to be the insect in his garden last season. His garden is near the bridge below the Market Square. He knew the pest in England, and feels that he could not mistake its work for that of any other fruit pest known in this country. Subsequently indications of the pest were found under the bark of trees in a neighbouring garden. Under

the circumstances few King William's Town residents are likely to go to the trouble and expense of banding and spraying this year, but each and every one should have all of the apple and pear fruits growing in his garden inspected at least once a fortnight and have every fruit seen to have a hole in it, or to which any "castings" cling, then gathered and so disposed of that any contained larva will be destroyed. The castings consist of brown pellets of excrement lightly held together in a roundish mass by strands of silk. They ordinarily protrude from the blossom end. This step, well carried out, should go a long way towards retarding the spread and multiplication of the insect, and it is quite practicable in the small gardens in and about the town.

THE WINE INDUSTRY IN SOUTH AFRICA.

By J. H. MEIRING BECK, M.D., M.L.A.

[The following article appeared in "The State," and is republished in these pages by request.]

It will, I think, generally be allowed that a country which builds purely upon foundations of trade can never be a country that will go very far in the development of national life or character.

For this more is necessary. For this it is essential that there should be due regard given to the fostering of industrial life. Society depends and must always ultimately depend upon nature for its livelihood and for all its activities, and it is clear that the nearer industries demanding skill and care and combinations of labour approach to direct contact with nature the more inevitable becomes their identification with the mainsprings of national life, and the more may they be regarded as national industries. This is probably the reason, recognised or unrecognised, why viticulture has at all periods in the world's history, and wherever a bountiful nature has made its development possible, loomed so large and been the subject of so much care and attention.

"That little corner has more charms for me than all where Nature grants a lengthened spring and mild winter, and Mount Aulon favourable to the clustering vine envies not the vintage of Falernus." (*Horace.*)

No wonder that countries like France, favourable to vine culture, with more imagination than we in South Africa possess, should have built upon the vine so large a measure of the civilisation to which the world owes so much, or that in Europe wherever the vine grows (France, Germany, Italy, Spain, etc.) enormous sums have been expended to foster it, enormous national care and attention bestowed upon it. But in South Africa, what is our outlook? Imbued with the purely trade ideals of late years, we have steadily elbowed our own product aside and largely displaced it by imported substitutes. Only too often have we gone out of our way to find arguments to demonstrate, instead of the benefits conferred by it, the injuries the wine industry has brought with it. Ignoring the history of this country and the part the vine has in the past played in its social and general development, many in South Africa can find no good word for it, and openly preach the doctrine that it must be got rid of.

In a country largely of no industries, where national foundations are as yet few, and which is growing in population day by day, where moreover the vine can be cultivated for economic purposes on limited areas only, what is to be said when even responsible politicians, blind to the future, openly urge viticulturists to take out their vines and plant other things? Do they realise the problems, social and economic, involved in a proposition of this kind?

That the vine so far has played an important national part in the making of South Africa admits of no doubt. Brought over by our Huguenot ancestors from France, it found here a congenial soil and climate. With the "Vitis Capensis," an indigenous plant, it was brought not to foreign soil but to a soil intended by nature for its propagation. Essentially associated with an industry requiring skill and care, and moreover capable of profitable culture on comparatively small holdings, it led, early in the history of South Africa, to close settlement and to the development of the kind of social and organised life which is only possible where people live closely together. This was an advantage in a young country that can scarcely be over-estimated, for at an early period it made possible results which, had we developed on purely stock-farming or other lines, would have been indefinitely delayed. It was inevitable that an industry which brought numbers of skilled workers together on the land should carry with it definite developments, and these soon found expression in the beautiful homesteads in the western districts of the Cape Colony which to-day still are the admiration of all who visit the vine clad hills of Constantia, Drakenstein, Stellenbosch, etc.

Another inevitable result was what, without it, would not have been possible to the same extent, or so soon: I refer to agencies working for social betterment like churches, schools, and other amenities of social life. To it can be traced the gradual growth of the schools, which are the pride of the western districts of the Cape Colony, and from which have flowed so much in the way of humanising influences for South Africa. Can anyone estimate what this has meant for a young country? Look at our bench, our bar, the Church, the profession of medicine, the legislatures of the land, and elsewhere, and it will be realised how strong an influence has flowed from these schools. Can the men and women who to-day all over South Africa occupy great positions and refined homes, very large numbers of whom but for these schools would never have had a chance, think lightly of crushing out an industry to which the land owes so much.

If closer settlement be a matter of national concern, and I have never met a responsible person who does not recognise that it is, can we regard the destinies of an industry which has brought about the close settlement of the wine districts as a matter of no consequence to us? To-day the following districts in the Cape Colony are either for a considerable part or wholly dependent upon the wine industry:—Bredasdorp, Caledon, Cape Division, Ceres, Clanwilliam, Ladysmith, Malmesbury, Paarl, Piquetberg, Montagu, Prince Albert, Riversdale, Robertson, Stellenbosch, Swellendam, Tulbagh, Uniondale, Van Rhynsdorp, Wellington and Worcester. The population of these districts is 500,000, of whom about 250,000 are whites—or nearly half the total white population of the Cape Colony, or the total white population of the Transvaal, or more than the combined white population of Natal and the Orange River Colony. In some of these districts exist, no doubt, other sources of wealth, but all are more or less directly concerned in the wine industry. If we take districts almost wholly dependent upon it—Robertson, Montagu, Paarl, Stellenbosch, Tulbagh, Wellington, the major portion of Worcester, and about one-third of Malmesbury—we find a population of 50,000 whites and as many coloured, and a property valua-

tion of £7,000,000 according to the Divisional Council valuation, which, as is well known, represents generally about half only of the actual value of properties. Can anyone say that the economic importance of an industry of this kind is, in view of the above facts, not a matter of national concern? Can we complacently, under such circumstances, face the economic and social disaster which inevitably must follow if through a continuance of short-sighted treatment we compel still further dislocation of so important and far-reaching factor in our national life?

We are told there is over production Is this so? When we compare what we are doing in South Africa with what is being done in other more or less similarly situated countries, we appear to be under rather than over producing.

Take a country like Algeria. Here we have a European population a little more only than ours, and nothing like what we believe and hope our South African population in the near future is going to be. There is also a large native population (three or four millions). The natives in Algeria, however, are, if not altogether, for the most part non-consumers of alcohol, being Mohammedan by faith. No legislative coercion exists, because France is a country that has long realised the fundamental truth that, if humanity is to be influenced for good, moral and social forces rather than legislative panaceas must be relied upon. In 1874 Algeria produced 4,000,000 gallons of wine, or just about the same quantity as South Africa produced in that year. At present we produce only 6,000,000 gallons annually, whilst Algeria has leapt up to 130 to 140 million gallons, of which enormous output not less than 30 to 40 million gallons are consumed locally, mainly by Europeans, who, probably because they are wise enough habitually to consume wines rather than spirits, are relatively a sober community.

So enormous has been the expansion of the wine industry in Algeria that it is small wonder that when Lord Blyth a year or two ago drew public attention to the extraordinary commercial benefits that have flowed locally from it, papers like the London "Times," "Westminster Gazette" and others should have quoted the Algerian example as an object-lesson worthy of being taken to heart in British Colonies.

Australia has benefited by this object-lesson, and is fast developing her industry. We on the other hand are standing stock still, and are advised to take out our vines.

Owing to the ravages of phylloxera, and on account of unsympathetic treatment, we are producing at present no more than we produced in 1891—about 1,500,000 gallons of brandy and about 6,000,000 gallons of wine. Our European population has increased during that period in the Cape Colony from 370,000 to 580,000, whilst in the Transvaal and elsewhere in South Africa the increase of population has been even more striking. The wine industry is probably the only one in South Africa which during a period of great expansion has remained, as regards output, exactly where it was twenty years ago, and this notwithstanding the creditable fact that under great difficulties enormous improvements have been effected in the quality of the product.

But let us examine the returns we have for the last available year (1908) of our net consumption of foreign spirits. It is true there has been during the last year or two a tendency in the Cape Colony and Orange River Colony for the imports of foreign wines and spirits to decline, but taking the present position as it is can we find any justification for the assumption that we are over producing?

Exclusive of Rhodesia, which naturally consumes considerable amounts, and furthermore not including considerable imports for consumption of

gin, rum, imported brandies and other spirits, there was within the Union last year a net consumption of 447,000 gallons of whisky, valued for Custom House purposes at £197,000, which works out at about eight shillings per gallon. When we consider that eight shillings represents an average value, and that whiskies for better-class consumption must have considerably higher values, it is apparent that at least a considerable proportion of this import must have been inferior and cheap whisky.

The figures for Natal and the Transvaal particularly reveal in this connection striking facts. Whereas in the Transvaal in 1907 273,000 gallons of whisky was consumed, valued at £138,000, in 1908 274,00 gallons were consumed, with a drop in value to £124,000. In Natal, similarly, 43,000 gallons consumed in 1907 had a declared value of £23,000, whereas 54,000 gallons (11,000 gallons more) consumed in 1908 were entered as having a value of only £22,000. Does this not conclusively show that a considerable proportion of the whisky introduced into South Africa is to-day considerably cheaper and by inference inferior to that introduced even a year ago?

But be this as it may, we consumed last year whisky to the declared value of £197,000. What does this considerable sum represent? At £4 per leaguer it represents the value of our total output of wine last year. But this is not all. Remember £197,000 is not the amount spent upon whisky in South Africa last year, it represents the value at the Custom House. With excise, freight and middleman's profits added, the consumer paid probably not less than four or five times as much

Now it is not too much to say that a great deal of this cheap whisky consumed in South Africa is manufactured from raw grain or other spirit, blended with a small proportion of malt whisky and flavouring ingredients. Why people should prefer this sort of thing to the excellent, wholesome and pure wine brandies now everywhere procurable is one of those things I do not hazard an explanation for, but this at least is clear—that while we are talking of over production we are actually spending upon an imported, manufactured substitute, in many respects not as good, pure and wholesome as our own wine and grape spirit, four or five times as much as the total value of our wine output, at a price (£4 per leaguer) not obtainable to-day

In addition, while we are pursuing the "will o' the wisp" of European markets, Portugal is actually developing a South African market for 2,000,000 gallons of wine annually (a third of our total output), a great deal of which is consumed by natives from the Rand, and paid for over the border with money earned inside the Customs Union.

Furthermore, whilst with all these facts existing we talk of over production, we are on the threshold of a development in South Africa which will not materially increase the area available for wine-culture, but must inevitably be accompanied by an indefinite increase of population.

With the extraordinary advantages we possess for vine-culture, it is incredible that hitherto the industry has attracted so little outside capital or attention. No doubt merchants exist who are doing a good deal to distribute our product, but can anyone knowing the facts of South African life gainsay that the agencies existing for the specific purpose of distributing South African wines and spirits are fractional to a degree. How differently France, Germany, Algeria, Australia, and other wine countries have behaved in this respect anyone even cursorily travelling through these countries will realise.

In a climate like that of the western districts of the Cape Colony, where the papyrus and palm often grow side by side with the northern pine and oak, we can and do produce wines ranging from the light wines of

France and Germany to the heavier types of Portugal and Spain. But so extraordinary is our attitude that many who should know better go even out of their way to deny that we can produce some of these wines at all, and instead of recognising the source of wealth to hand can find no good word for those who under great difficulties and discouragement are keeping the industry alive.

And what have we gained so far by the disabilities we have created for this industry? Our licensing laws, ostensibly designed for the purpose of diminishing drunkenness, and more particularly for keeping drink from the natives, treat wines and spirits upon the same basis. Designed with the best of intentions, they have ignored the fundamental facts of human life, and they are failing as coercive laws always in the long run must fail. Instead of going to wine countries, which as a rule are sober countries, for legislative models we have gone to countries like England and Scotland, and the same results are following here as there. Steadily we are building up liquor trusts and monopolies, which are largely dissociated from and opposed to the wine industry. Steadily, as in England and Scotland, we are converting South Africa, its climate notwithstanding, into a spirit-drinking country, until already there is little outlet for the product of the vine, unless distilled into spirit.

And what is the further result? To quote one or two instances only, out of many that could be quoted. What are we to say when the Chief Magistrate of Cape Town informed a Parliamentary Select Committee (1907) that whilst under the licensing regulations in Cape Town there is practically total prohibition for natives there were, notwithstanding the organised police supervision possible in Cape Town, during 1906-7, more arrests for drunkenness amongst those supposed to be totally prohibited than amongst any other class of the community? His figures were 4 per cent. for prohibited natives, 3·2 per cent. for coloured people, other than natives, not prohibited, and 2·6 per cent for all classes combined. Again, what are we to say when the Magistrate of King Williamstown informed the same Select Committee that natives on the frontier were steadily taking to brewing kafir beer, which is not only, by the addition of sugar, honey, etc., made much stronger than of old, but which, to quote his own words, "seems to render a man more helpless and heavier than intoxication from spirituous liquors?" He furthermore drew the Committee's attention to the way this strong kafir beer was demoralising not only men but women and children, and related how, a short time before, in going from a native location near the Green River, he had seen between thirty or forty native men, women and children lying helplessly drunk by the wayside after a kafir beer orgie. As the matter stands, whether we like to recognise this or not, the native is for his alcohol entirely independent of anything we can supply him with, and the individual must be sanguine indeed who imagines that by any conceivable legislation he will be able to prevent this from going further.

In the Transvaal, what is the result? Let a speech made last year (1908) by Mr. De Villiers, Minister of Mines, testify. He had been struck he said by the number of convictions for illicit liquor-selling in the Transvaal. From statistics which had been prepared, what struck him particularly was the number of *white women* who were being made criminals by the present liquor law. When they found that this had caused 1,200 people to be put in gaol yearly under this one law, then it became time for them to pause. Was it under the circumstances justifiable to save the native from drink, *which he could get in his own kraal*, when they saw that the illicit drink trade was increasing day by day and growing on a large portion of the country.

Truly might the Minister of Mines say that it is time to pause when so appalling a breakdown of restrictive legislation has resulted that in a country like the Transvaal 1,200 people—and amongst them many white women—are annually imprisoned for illicit liquor-dealing. And they represent not those who are engaged in the traffic, but only those who are detected.

It is not an easy thing to stand up in defence of more rationalism in our liquor policy. Only too often one is misunderstood, and accepted as desirous of knocking moral props from under society. I am, therefore, in conclusion, the more gratified in being able to quote the following from a speech made by a gentleman whom no one will accuse of a disregard for public morality. Speaking some months ago in England the late Prime Minister, Mr. Balfour, said:—

"I have sometimes considered whether in the long series of legislative enactments connected with alcohol in England we have not been on the wrong tack. On the Continent, at all events, you see—and everybody who has been there must rejoice to see—a man and his family going to enjoy music, hearing the band, and enjoying nature and art, and accompanying that enjoyment by the consumption of lager beer and alcohol, which is rarely under such circumstances used to excess. Who but must regret that we see so little of that in this country, and that when a poor man desires to consume alcohol, even in the utmost moderation, you for the most part compel him to go to a house in which you have forbidden, by the police and other regulations, anything to take place except the bare sale of drink. . .

"Whether I am right or wrong, at all events *I am absolutely sure you will never get morality forced upon a great community by legislative enactments.*"

MILK RECORD.

ELSENBURG COLLEGE HERD.

Subjoined is the Milk Record to the 31st October, 1909 :—

Breed and Cow.	Days in Milk.	Yield in Lbs. During October.	Yield in Lbs. Total to date.	Daily Average.
FRIESLANDS.				
Cleopatra	181	955	7,811	43·1
Victoria	172	1,064	6,888	40·0
Vera	130	893	3,861	29·7
Violet	111	881	4,103	36·9
Bell	99	1,367	1,537	45·8
Belladonna	62	782	1,701	27·4
JERSEYS.				
Gertie	174	752	4,596	26·4
Gwendolen	130	769	3,268	25·1
Grace	130	637	2,737	21·0
Gladys	123	852	3,387	27·5
Gus	80	770	2,032	25·4
Fanny	68	701	1,600	23·5
Gillflower	61	966	2,017	33·0
Glee	14	368	368	26·3
AYRSHIRES.				
Queen Dot	119	713	3,243	27·2
Lobelia	108	767	3,231	29·9
SHORTHORN.				
Maggie	109	1,030	3,598	33·0
CROSS.				
Bessie	130	1,402	6,243	48·0

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EXPERIMENTS WITH OSTRICHES—XI.

ACCLIMATIZATION—HERR CARL HAGENBECK'S OSTRICH FARM AT STELLINGEN, NEAR HAMBURG, GERMANY.

By Prof J E Duerden, M.Sc., Ph.D., A R.C S., Rhodes' University College, Grahamstown

One of the most remarkable developments in the domestication of the ostrich is the recent establishment of an ostrich farm by the famous importer of wild animals, Herr Carl Hagenbeck, at his Zoological Park at Stellingen, near Hamburg. In response to an enquiry, Herr Hagenbeck has sent a full description of his undertaking, together with a series of twenty photographs, and from these the following account has been prepared. The matter is one of special interest to ostrich farmers in South Africa from the fact that it proves that the African ostrich can be acclimatized to the frost and snow of the winters of Northern Europe, thus adding one more to the now long list of tropical and sub-tropical animals which have been found to live and breed in temperate parts.

The Stellingen farm was opened on the 21st June of the present year by Her Majesty the Empress of Germany. On the opening day it contained one hundred and fourteen adult ostriches, and, as if to complete the interest of the ceremony, the first chick was hatched from the incubator on the same day. With the exception of fourteen ostriches (including two Cape hens) all the birds have been caught wild and imported from different parts of Africa, where the Hagenbecks have their agents and collectors; the firm has also lately expressed its desire to purchase examples of the most valuable of the Cape Colony birds. Most of the birds arrived in Germany only in April and May of the present year, and are therefore not yet fully acclimatized. But of the fourteen original birds, several have been there during three or four winters, and are left out of doors both winter and summer, notwithstanding that Hamburg would seem to have a very unfavourable climate for ostriches which are indigenous to warm dry conditions. Even in summer the amount of sunshine in Hamburg is comparatively small, rain falling as frequently as five days out of the seven, while last winter much snow fell, and the thermometer registered 40 degrees of frost. The ostriches are left out in sunshine, rain or snow, being only housed at night in an unheated building, where they are given a good bedding. Should the ground become covered with ice after heavy rains, the attendants throw sand over the surface, and the birds are then allowed to roam about.

Herr Hagenbeck gives the following account of how he came to start the ostrich farm in Germany, which is the first in Northern Europe. A few years ago he was very crowded for room at his old Zoological Park

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in Hamburg, and the few ostriches he then had were sent out to Stellingen in October, and put in an old wooden shed. Being away on a business trip, the birds were almost forgotten, when in November, after a severe cold with about a foot of snow on the ground, they were found to be doing splendidly, though formerly when in the city they always died in the heated room in which they were kept. From that day Hagenbeck came to the conclusion that it was best to leave the ostriches out of doors even in the winter, only closing them up at night. Visiting the Riviera he saw the well-known ostrich farm at Nice, but was rather disappointed with the birds, and came to the decision to start an ostrich farm at Stellingen as soon as means would permit. At the Nice farm he secured the services of a young American who had also gained several years' experience in ostrich farming in North America, and was specially trained in incubating ostrich eggs. By his efforts twenty chicks have been hatched during the past season, only one of which died, having been born blind. During the fourth and fifth weeks the chicks grew 1 lb. daily.

Five geographical varieties of the ostrich are represented in the flock—the Somali, East African, West African and Cape ostrich, and two from the neighbourhood of Abubaama, a tributary of the Blue Nile. The weakest specimen is stated to be a hen obtained from an ostrich farm in South Africa, while the North African are two beautiful birds. A nearly mature cock from East Africa stands almost six feet from the ground to the top of the back.

The farm covers an area of about three morgen, and is divided into large paddocks for the feather birds, with a pond in the middle in which the birds are allowed to bathe, the whole surrounded by walks for the visitors. A large, well-ventilated house is provided for enclosing the birds at night. Breeding pairs are camped off separately, and are provided with smaller sheds. Special chick and incubator rooms have been erected, the former heated artificially while the chicks are very small; a building to serve as a hospital and for birds until properly acclimatized has also been added. The two photographs here reproduced show the birds in paddocks with the ground covered with snow. Other photographs show the main house, the sheds for the breeding pairs, and the chick house, while one shows an ostrich harnessed to a light cart and another a bird being ridden.

Herr Hagenbeck states that the reason for establishing the farm is to breed together the best of the different varieties of ostriches from all the different parts of Africa, and thereby improve the bird. It is held that these birds will be useful for renewing the blood in the different ostrich farms of the world, for, from the circumstances under which they are selected and reared, the strain will become exceptionally strong and hardy. He even thinks that the South African ostrich farms will take some of his birds in order to improve the blood. The opinion is expressed that there need be no fear of over-production of feathers, for it is hoped that soon ostrich feathers will be as fashionable in Germany as they are in England, and that as time goes on they will replace the smaller birds of different kinds slaughtered for their ornamental plumage.

WESTERN PROVINCE WINE SHOW.

The Annual Wine Show held by the Western Province Horticultural Board was held on the 26th and 27th ult at Parker's Buildings, Cape Town. Appended is

THE PRIZE LIST.

WHITE WINES

Class I: Hock—1, Drostdy Co operative Winery, Ltd., Tulbagh: 2, P. and P Rabie; 3, Jas. Malan; h.c, Klein Constantia Estate.

Class II.. Sauterne—1, Klein Constantia Estate; 2, J. A. Brink; 3, P. and P. Rabie; h.c., Drostdy Winery, Tulbagh.

Class III. Sherry.—1, Jas. Malan; 2, E. Lange

Class IV.: Madeira.—1, Drostdy Winery, Tulbagh.

Class V.: Sweet White Wine.—1, P. and P. Rabie; 2, Drostdy Winery, Tulbagh.

Class VI.: Stein.—1, Klein Constantia Estate; 2, Otto Rathfelder.

Class VII.: Green Grape.—3rd only, Drostdy Winery, Tulbagh.

Class VIII: White French.—1, Drostdy Winery, Tulbagh.

Class IX. A.O.V. White Wine.—1, each, C. W H Kohler and P and P. Rabie.

RED WINES.

Class X. Claret.—1, High Constantia Estate: 2, Hohenort Estate, Wynberg; 3, F. Versfeld.

Class XI.: Burgundy—1, Alphen Winery: 2, J. A. Brink; 3, High Constantia Estate.

Class XII.: Heavy dry red wine.—1, G. A. Retief.

Class XIII: Heavy Sweetish Red Wine.—1, Drostdy Winery, Tulbagh.

Class XIV.: Sweet Red Wine.—1, P. and P Rabie; 2, Drostdy Winery, Tulbagh.

Class XV.: Hermitage.—1, J. A. Brink; 2, Hohenort Estate, Wynberg: 3, Alphen Winery.

Class XVI.: Cabernet de Sauvignon.—1, F. Versfeld; 2, J. A. Brink; 3, High Constantia Estate; h.c., Hohenort Estate, Wynberg.

Class XVII.: Pontac.—1, G. A. Retief; 2, P. and P. Rabie; 3, Alphen Winery.

Class XVIII: A.O.V. Red Wine.—No award.

BRANDIES, LIQUEURS, ETC.

Class XIX.: Wine Brandy.—1, High Constantia.

Class XX.: Van der Hum.—1, High Constantia Estate.

SPECIAL PRIZES.

Class XXII.: Light White Wine, Jagger Cup.—P. and P. Rabie: reserve, Drostdy Winery, Tulbagh; h.c., Klein Constantia Estate.
Class XXIII.: Light Red Wine, Wine Merchants' Cup.—F. Versfeld; reserve, High Constantia Estate.

JUDGES' REPORT.

WHITE WINES.

Sixty-six samples were sent in for competition in the white wine classes. Of these only two samples were not in a perfectly sound condition. All other samples will, after further careful manipulation, yield a wholesome, sound wine, representing approximately 427,000 bottles.

Hock type: The competition in this class was poor, though the quality of the prize wines was very superior.

Sauterne type: The class of wines exhibited under this head were far from similar to real Sauterne wines. The only exhibit resembling a real Sauterne was No. 51, exhibited in Class 9.

Sherry type: We would like to bring to the notice of exhibitors that the wines shown in this class were not exactly descriptive of real sherries.

Sweetish White Wine, Class 4. The competition was very limited, though the prize wine represented a very high standard.

Stein, Class 6: Ten samples were exhibited, of which two were superior

Green Grape, Class 7: The exhibits in this class were indifferent, and only one (third) prize could be awarded.

White French, Class 8: Here also the competition was very limited, which is much regretted, seeing that this class of wine suits the requirements of our climate.

A.O V. White Wine, Class 9. All the exhibits were sound, and amongst them was an excellent exhibit resembling the real Sauterne type.

Jagger Cup, Class 22: A good exhibition. Here the judges had great difficulty in deciding, but after careful testing and consideration awarded the cup to Exhibit No. 117

WINE BRANDY.

Of the four samples exhibited, No. 107 is a most carefully prepared wine brandy, to which the first prize was awarded.

VAN DER HUM.

Only one sample exhibited, to which a prize was awarded.

RED WINES.

Out of 63 exhibits, 61 were good, sound, and well prepared wines.

Claret, Class 10: In this section the competition was very keen, and the general quality of the wine excellent. First prize was awarded to 57, second to 56, and third to 51.

Burgundy type, Class 11: These exhibits were also on the whole very good. These wines were very carefully prepared, and will improve with maturation, the year 1909 being a good red wine vintage. First prize was awarded to No. 75, second to 73, third to 68.

Heavy Dry Red Wine, Class 12: Only two samples were exhibited, and the prize was awarded to No. 79.

Heavy Sweetish Red Wine, Class 13: Only two exhibits sent in, and the prize awarded to No. 82.

Sweet Red Wine, Class 14: Two exhibits, prizes were awarded to each —first to 85, second to 84.

Hermitage, Class 15: The competition in this class was very keen. There were seven exhibits, all good, sound wines. The prize wines were of a superior character. First prize was awarded to 88, second to 86, third to 90.

Cabernet de Sauvignon, Class 16: A very fine display of wine was put up in this section, causing keen competition. After careful examination and tasting, the prizes were awarded as follows: First to No. 96, second to 97, and third to 94.

Pontac, Class 17: Amongst the wines exhibited in this class, the prize wine represents the class of wine most suitable for making port wine, and the manufacture of this wine should be encouraged.

A.O.V. Red Wine, Class 18: The only exhibit in this class was wrongly entered.

Wine Merchants' Cup, Class 23: All the exhibits in this class combined to make an excellent display of red wines, very carefully prepared, and promise to develop into wines of very good quality. After prolonged and careful tasting and examination, the judges selected two samples, 128 and 126, and finally decided that the prize be awarded to No. 128.—(Signed) P. Daniel Hahn, Fred S. Green, T. L. Watermeyer, Judges.

Report by Dr. Hahn and Mr. F. S. Green on wines sent "for exhibition only" by the Government Wine Farm, Groot Constantia

These wines are of such a high quality that they may be deemed worthy to be taken as a standard of a type of wine to be worked up to for this country.—(Signed) P. Daniel Hahn and Fred S. Green.

DOMESTIC SCIENCE FOR SOUTH AFRICA.

WHAT MAY BE DONE

By E.M.C.L.

During the last few years domestic science is being developed in all civilised countries. There are many causes which have led to this instruction having passed from the mother to the school, and we cannot but state the fact and applaud it, that after years of neglect, modern education again begins to take into consideration the necessity of preparing the girl for her task as housewife

In the youth of this science lies its power. People have not asked themselves according to what educational scheme has the work been done, what syllabus has been prescribed, for what examination are we preparing? No: people have said: What ought a woman to know; we will teach it her. And so they have set to work; ever with a certain object in view, although no one asked to have that object described too exactly. Anything tending to qualify a woman for the comprehensive task of housewife, might be considered to belong to the science: any sub-division, which was thoroughly taught, led to the aim in view Thus that science has, during the last twenty years, developed in various lands in various manners, with and without State aid; here in large schools, elsewhere in small classes, for the daughters of the people or for the daughters of the privileged classes, differing in methods, differing in subjects of instruction, sometimes theory with little practice, sometimes practice with little theory, but always one in this principle: Woman had to be instructed in her task as housewife. That task is important enough to demand during her school years a portion of her time and application; it is a public interest that this should be recognised.

To such an extent were they aware of this unity of purpose with diversity of methods, that in September, 1906, representatives of domestic science from a number of countries met together in Switzerland at the first International Congress on Domestic Science for the purpose of deliberating with, and to learn from, each other.

There were people present from Switzerland, Italy, Germany, France, Belgium, the Netherlands, Denmark, Sweden, Finland, Austria, Roumania. Although there was a report on the science in England, it does not appear that one English speaking nation was represented at the congress, and it may therefore be news to communicate something of what was discussed.

For those who take an interest in the education of South African girls, there is much in the reports of the Congress which is worth while considering. For many of the countries represented at the congress have a population living on the land, and a large part of the discussions was

devoted to the necessity of so organising domestic science, that the future farmer's wife not only learns what will be her work later, but that she learns to do everything with that love, that interest, which is the result of well knowing and well understanding.

Domestic science does not exclude a good school education; it even takes it for granted that the pupil should generally be well educated before following the new lessons; for only then domestic science can open the eyes of the young generation to the responsibility of the work that is waiting, so that even the most simple duty on a remote farm becomes one worth being done well

These are no idle words; in one year, passed at a school of domestic science, the writer has learnt what the influence of the housewife means, so that now, after 16 years, she still daily thankfully remembers that time. The most simple work has a lustre of charm and at the same time the idea has been formed that this field of labour demands so much from heart, hand and head that the study is never quite finished.

The two volumes of reports on this Congress are too comprehensive to give all there is in it. There are important reports on the arrangement of courses, on permanent schools and temporary courses at smaller places, reports on the training of teachers And here again voices from the land request that in the first place such girls should be trained as teachers as know and understand life on the land. May this be a hint to the girls of South Africa to see that it will not do to wait until England sends the necessary teachers. For the science to flourish it is necessary that *our* girls should feel the call to devote themselves to the study of this branch.

Further, there are extensive schemes of instruction, discussions on the question how far theoretical education should go: what the children should know of chemistry, nature science, trophology, knowledge of commodities, what methods are the best for teaching cutting clothes, and domestic bookkeeping.

There is a report on the desirability of connecting with the school a place for the keeping of infants and a description of such an establishment, where children of from a few weeks to two years are taken care of by the pupils under supervision of a directress, where the babies are bathed, fed and clothed by future mothers and nursery-maids.

But the most important for a paper like this are those reports, in which it is urged to teach young women of the land, besides cooking, sewing and washing, how to milk and to churn, care of poultry and horticulture, and all with a knowledge of and under application of new methods and appliances. Only so, it is said, woman will be properly prepared for her place at the side of the agriculturist, trained according to modern ideas; and thus prepared it may also be expected that she will co-operate with all the pleasure and working power, that is in her, without hankering after a life in town, through which so many of our best people have already disappeared from the land. And here I would like to remind my readers of the address of Mr. Lee, recently given at Cape Town, in which he pointed out the necessity of providing such an education for the future wife of the student at Elsenburg, as would be of more benefit to her than working for university degrees. I would also like to mention that rumour has it that there exists projects for a new training in this direction.

Finally there is a description of a Swedish school, which makes us think: If we had only such a school! It is my personal experience that, if there is the will, and sufficient earnestness, a school for domestic science has always the prospect of succeeding. Money is wanted, but whoever is content with a small beginning, wants so little that it is always possible to obtain it. I have given lessons in oddly arranged kitchens, where every-

penny was turned twice before it was spent; where pupils paid 1d. or 2d. per lesson, and the expenses of the course were not allowed to exceed £8. And though simple the beginnings may have been, at present there are grand and lofty buildings where the work is continued with success. Town, province and government of the country now aid by grants after private initiative has made known the science and made it beloved. Already a few daughters of this country have commenced preparing themselves for this work; might more follow them! Whosoever knows, as I do, with what pleasure exactly the more educated girls follow the lessons, can recommend right heartily this preparation for a teacher of domestic science. And the more there are, who devote themselves with enthusiasm to this new branch of science, the sooner it will spread throughout the whole of the Colony, and become a blessing to many

Our correspondent has kindly submitted the report of the Congress held in 1908, from which the following paper is extracted.-

THE FREDRIKA BREMER SOCIETY FARMING SCHOOLS FOR TRAINING TEACHERS

In Sweden, as we think the case to be in most other countries, the progress in the agricultural department, made in the last decades of years, has proceeded in a rather prejudiced direction, *i.e.*, the progress has passed on principally in the field which may be considered as that of man, and comparatively little progress has been made in the field of woman. Men's training courses of every kind have been established, from the Government institutions where the higher agricultural instruction is imparted, to the schools and courses bearing upon the interests of small farmers who can stand only a short apprenticeship Every year has brought new schools and new forms for farmers' training

At the same time it is true that a great deal of work has been bestowed on the development of the Swedish woman as to her work at home, but what has thus been made, has sufficed little in a country of such great extent as Sweden. Establishing of institutions for training teachers for cooking-classes, foundation of cooking-classes in the towns and at some country places, and the so-called ambulatory cooking-classes, which give in the same manner short courses to housewives, are, besides some dairy courses and nursery gardens, the principal establishments of this kind. However, there has existed no particular school for teaching things that a farmer's wife has to manage, including consequently except cooking and housework, cattle farming, poultry farming and horticulture.

Decennium after decennium, however, has showed the necessity of changing the state of things in the country, as regards the work of woman. The farmers' wives have often been unable to acquire, through their mothers or otherwise, such knowledge as can enable them to do their work in a satisfactory manner. The consequence has been that the management of the household becomes too expensive, and at the same time the food of the families has often been insufficient. Another consequence is that people do not make the most of the by-work of farming, *i.e.*, poultry-farming and horticulture, which should be managed particularly by women It is further stated that the produce which is brought forth is not of sufficiently good quality to be sold advantageously; that the whole housekeeping work is too, and that, in consequence, the interest in the management of the home is not what it ought to be.

As in man's sphere of work a stirring up has been attained through the training of teacher powers, the Frederika Bremer Society, a large women's association in Sweden, considered that teachers, especially trained with regard to the demands of the country, would be necessary, and thus it was resolved to found the Frederika Bremer Society Farming-School for training teachers.

The plan of the school was presented in the autumn of 1906, and as soon as in the autumn of 1907 the school was ready to receive 20 students. Such a rapid development depended partly on the support as well from private persons as from public institutions, partly of course on the fact that, when the idea was once suggested, it was received with such great sympathy. It was considered, as a peasant expressed himself, that "it was not one day too early that this school was founded."

The leading idea is that the school should not only give the students knowledge in the necessary subjects, but also accustom them to the conditions prevailing at the small farmer homes. A small farm of such a size as may be regarded normal for a small farmer family in Sweden is connected with the school, and it is this small farm that is, so to say, the centre of the whole. *The school* and *the small farm* both belong to the same institution, but they have separate bookkeeping, and they work isolated from each other.

All the students live in the schoolhouse, and there they practise cooking, tidying up, dish-washing, baking, preserving, washing, and all other kinds of work which are to be found at a home. In the school all theoretical lessons are held. These are common to all the teacher students.

The students work by turns for a fortnight at each of the five departments of the school

Group I., Cooking, does cooking to the great household, *i.e.*, all the students and teachers, except those belonging to the small farm. The food must be plentiful but simple. Much stress is laid upon saving time through simplified working systems and practical arrangements for the disposition of work. Thus a so-called "hay-box" is used for long boiling, for instance, porridge and pea soup. A pot with the common ingredients of porridge, for example, boils on the fire about 15 minutes, then it is put into the hay-box, which keeps the warmth so well that the porridge is ready boiled and kept quite warm (about 80 degrees Cels.) after three or four hours. The advantage of using the hay-box is saving of wood: moreover, the food cannot be burnt, and the housewife, who otherwise has to look after the porridge and the fire, can give her time to other business, for instance, work in the garden or in the field.

Group II., Tidying up and Dish Washing, does almost without help the work belonging to this department.

Group III., The Small Farm, does the work that is generally performed in Sweden by women at the small farms. The group of students working in this department begin their work at 5.30 a.m. in the cow-house, where they do it, without anyone else helping them. The cow-house, new-built and fine, has room for five cows, two oxen, two calves, and some poultry. The students take care of the cows, take the dung to the dung-yard, and manage the latter; it is not usual everywhere in Sweden that women take away the dung and manage the dung-hill, but the school considers that the students should be well accustomed to this important business, in order to be able to impart knowledge of it—feed the cows, milk them, manage the milk, make butter, cheese, etc. They also have charge of pigs, calves and poultry. While three of the students do the work in the cow-house and the dairy, one of them remains in the cottage, where she acts as a housewife, putting things in order and preparing food for the

group. The housewife also bakes and washes for her home, weaves, does the bookkeeping, etc. At the small farm one goes in for saving in every respect; one generally tries to get the arrangements as plain as possible, in order that the aim may be attained, *i.e.*, that the students may leave school with some experience and practise in the circumstances of a small farm. Through the little farm, belonging to the school, the students become associated with the customs of farming. No business interests the students more than the work at the small farm, and this though the work is very hard there. It never happened that a student shunned the work because she thought it mean It is proposed that the students shall take part, to some extent, in the agriculture, which is managed by a man-servant, engaged at the school, but the school lays no particular stress on training the students for agricultural work, *i.e.*, for man's sphere of farming. It is that sort of training which bears upon woman's capacity of managing her share of work that the school has most at heart.

Group IV., Horticulture and Handiwork.—The handiwork is removed to winter time, and includes, as to sewing, plain needlework by hand and with machine, making of chemises, etc., and a plain dress, instruction in pedagogic sloyd, and, as to weaving, in the first place mounting of webs, in order that full experience of it may be acquired. Each web is mounted rather short for the purpose of obtaining practice by mounting many webs. The students also learn spinning, knitting of stockings, etc. In other words, they learn that kind of handiwork that ought to be known by every clever housewife in the Swedish country.

When Spring sets in, the handiwork is put aside for the gardening. In order to increase the interest, the garden is divided into five quite separately working gardens, and each group of students has the care of one of these gardens, from Spring to Autumn. Each garden has the ordinary largeness of that of a small farm, and contains the vegetables that generally are found or should be found there.

Group V., Baking and Washing, makes the principal bakings and small washings. A washing machine, the Favourite, is used.

In summer, housewife pupils work at the school, as well as teacher students. The housewife pupils generally are peasant girls from the neighbourhood, who, having passed through a six months' course here, return to their homes. It is an advantage to the school that the teacher students can acquire practice by teaching the housewife course going on at the same time; besides, the teacher students profit by having intercourse with the kind of youth who later on is to become their pupils, and by trying to understand them. Another advantage is that the housewife pupils take part of the practical work in which the teacher students have already attained proficiency, and thus the teacher students can get more time for gardening. In this way it has been possible for students of every group to do gardening-work throughout the whole summer.

The theoretical instruction includes science of nutrition and food, chemistry, physics, botany (cultivated plants), physiology, hygiene, children's nursing, bookkeeping, household budgets, etc., dairy work, gardening, and agronomy. In order to give practice to the teacher students, so called demonstrations are held, when the students, in the presence of teachers and some fellow-students, prepare a dish, and at the same time describe how the cooking should be done. The object of lessons is partly to accustom the students to give a plain account of the preparing of a dish, partly to accustom them to impart the essential knowledge they have required. The student should tell during the lesson what she considers the most important thing to be observed, for instance, at the cooking of potatoes. She ought to put as the object of the lesson to

present to the country women what can be most important for them out of the knowledge she has acquired herself, in order that the instructress may be able to know what may be fit to impart for the future. At the lesson the question of the quality of the articles that are used in the dish should be emphasised. The cost of the dish, the possibility of self-production, the method of storing the articles that are used should also be spoken of, *i.e.*, the lesson will not give an opportunity for the student to present all that she has learned concerning the dish which is prepared or the ingredients in it; it is not meant, either, to be a proof of a future lesson, but it is a practice of carefulness and conscientiousness to make a lesson include what can be useful to the pupils she will have to teach. Specimen lessons are held, as is said above, with the housewife pupils, and besides the student will practise at cooking-classes for the children of the place.

The premises of which the school has disposal are very conveneint for the purpose.

To be admitted into the school as a teacher student, higher education is required, as a rule. This condition, however, is not insisted upon, and students who have only passed the board school can be admitted. Seven students of that kind now belong to the school. The difficulty of bringing together pupils of such a different range of knowledge has appeared much less than expected. If some students meet with difficulties in studying chemistry and physics, it is about the same for others with milking, etc. Candidates for admission to the school ought to be healthy, and to have completed their twentieth year.

As to the economy of the school, it received for its establishment 2,500 kronor from the Government and 3,900 kronor from the Royal Agricultural Societies, as well as some money from private persons. From the Government the school receives an annual grant of 4,000 kronor.

The teacher students pay 600 kronor a year in all, and the course lasts for 1½ years.

The housewife pupils pay 30 kronor a month, and the course lasts for six months.

The time of work, comprehending both theoretical and practical work, is about 7½ hours a day: the preparation of lessons is not included in this time.

At the school a principal and four teachers are appointed. Extra teachers give lessons in some branches.

When the training is completed, the students are to become teachers at stationary cooking classes, ambulatory cooking classes, and farming schools in the country, a new kind of schools.

At the Fredrika Bremer Society Farming School for training teachers the first course is now going on. That the next course in certain cases will be arranged in a different way, is very likely. As an instance, we beg to mention that the course will be extended to two years, a year and a half having been considered too short a time. But the leading idea, the connection of the teaching institution with a small farm where the students become familiar with the conditions prevailing in the life of country-women, this idea will, of course, be the same, as it seems a true and proper basis on which to erect the building.

THE COTTON STAINER BUG.

By CHAS P LOUNSBURY, Government Entomologist

The Cotton Stainer Bug has not been the subject of field study on the part of the writer, but the insect appears to be so formidable a pest to the incipient cotton industry of the Transkei and the extreme south-eastern districts of the Cape Colony that he deems it advisable to present a compiled account of the insect to readers of the *Agricultural Journal* It may be many years before the creature is made a subject for special enquiry

There may be more than one species of plant bug in the Cape Colony that merits the name Cotton Stainer All of the specimens which have been received at this office, however, are of a species which has been determined at the South African Museum as *Dysdercus superstitiosus*, Fabr Last season Professor Robert Wallace, of Edinburgh University, collected specimens of much the same appearance when visiting the Rhodesia Cotton Company estate at Bamboo Creek near Beira, in Portuguese East Africa. These specimens were identified by Professor R Newstead, of the Liverpool School of Tropical Medicine as *Dysdercus fasciatus*, Signoret Later the identification was confirmed by Mr. C. O. Waterhouse, of the British museum, who added, "I think *D. nigrofasciatus*, Stäl, can scarcely be considered distinct." This information was received by this office in a note from Professor Wallace. Specimens which we have had from Bamboo Creek are much redder than the Cape specimens considered as *D. superstitiosus*, but are marked in much the same way and are of the same size. The length is one-half to three-fifths of an inch, and the greatest width one-fifth of an inch The outer part of the wing covers is almost black, while the fore part is light coloured in contrast. Across the middle of the wing, on the lighter ground, is a band of black, and the back of the head between the eyes and the back of the thorax are each crossed by a black band of about one-half the width. Thus when the wings are folded over the back at rest, the body appears crossed by three black bands, the hindmost of which is most conspicuous. The general colour of immature specimens of the bug is decidedly red.

One species or another of the genus *Dysdercus* trouble cotton more or less in most cotton-growing countries. North and South America, West Indies, West, South and East Africa, India, and Australia, all share in this common kind of pest. The damage caused in South Africa may at present be more than it is elsewhere, but there is no known reason why it should continue to be so if cotton-growing were conducted on a large scale and the methods of other countries in disposing of seed and old plants and of repressing the insects were practised. Eight different species are definitely recorded as cotton pests. These doubtless vary somewhat in their habits, but in the main what is true of one seems to be true

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of all that have been studied. The writer of an article on cotton insects in No. 2 of Part V. (1907) of the *Bulletin of the Imperial Institute* says of the group:—

All these bugs are red and black, but vary from each other in their markings. The earlier stages, before the insect has begun to develop the hemelytra or wing covers, are passed inside the ripe cotton bolls; the younger forms are brilliant scarlet or crimson. There are no distinct changes similar to those found in Lepidoptera (moths), the wings growing gradually as the insect gains in size. Owing to the presence of the young inside the opened cotton bolls, they are often gathered with the lint and crushed in the process of ginning, thereby causing a stain, but the stains are also produced by the excrement of the mature insect. The female bug deposits her eggs in the cotton, and the small bugs soon emerge and commence to feed upon the seed, sucking the juices from it. Afterwards they puncture the unripe bolls left on the plant, and destroy the cotton inside while it is yet in a gelatinous form.

In discussing the Indian species (*D. cingulatus*) in *Memoirs of the Department of Agriculture of India*, No. 3, Vol. II. (1908), the Imperial Entomologist of India, Mr. H. Maxwell Lefroy, tells that the life cycle of observed specimens ranged from 42 to 82 days. He found the number of eggs laid by reared females to vary from 80 to 100. He further says: —

The eggs are laid in a loose, irregular mass, poured out one after another and devoid of any external gum to bind them together. In the field they are laid in cracks in the soil, under loose leaves or other debris, at the roots of plants; when laid in the soil, the female scratches loose soil over them, not only as a protection but with the object of preserving them from becoming dry. Exceptionally eggs are laid on the bract of a cotton boll; they are also laid in the lint of open cotton bolls; cotton which is picked at the commencement of cold weather may contain eggs which hatch quite normally, the cotton thus being infested with the bugs which continue their development in the picked seed-cotton.

The habits of the nymphs are similar to those of the adult, and all stages are found together. Normally these insects feed more or less gregariously by day, exposing themselves freely on their food plants and forming very conspicuous red clusters. This habit agrees with the distinctly warning colouration and the defensive odour, the bug advertising itself as inedible in every possible way. They are active, running freely about; the adults seldom fly and the wings are but little used. Food is derived by suction, fine setae of the proboscis entering the tissues of the plant, enabling the sap to be pumped out. Normally these bugs feed on such parts of the plant as contain much sap or mucilage, or extract the oily matter from seeds.

In the first place; the bugs reduce the vitality of the young shoots by sucking them: this very rarely occurs in the field and is, we believe, a negligible form of damage. The main attack is on the green boll; the sap is extracted from the mass of developing lint, or if the boll is young enough, from the whole developing boll; the result is a small boll, containing bad fibre, which opens prematurely and is practically worthless. Badly attacked green bolls allowed to mature do not form to large bolls which open normally and bear a mass of good fibre. Very small bolls thus attacked fall off. The attack on the riper bolls is less injurious to the lint, but if the boll opens, the bugs suck out the seeds and they dirty the lint with excrement; further the young either hatch there, when eggs are laid, or they gather in the lint to feed on the seeds and picked cotton frequently contains young nymphs which get crushed and stain the lint.

A detailed study of species troublesome in the West Indies was made some years ago by the Imperial Entomologist of the West Indes, Mr. H. A Ballou, and his findings were much the same as those made later in India. Owing to the insidious manner in which the insects work, there is considerable difficulty in determining how much damage should be attributed to them, and consequently much difference of opinion amongst growers as to their practical importance. The Cape species has been so remarkably abundant in some fields that there was no mistaking its connection with damage. One correspondent wrote: "These bugs swarm on every boll of cotton just as it begins to open and destroy it." Another wrote: "The bug not only delays the reaping but discolours the wool and feeds on the cotton just as it is ripening. It destroys the wool to such an extent that it is not worth while to reap it. It seems to prefer the

Egyptian as it has destroyed practically the whole crop of this kind." The species which occurs at Bamboo Creek, near Beira, is also recognised as exceedingly injurious. In a recent letter, Professor Wallace wrote that it "did very great damage last season." Little is heard of this kind of pest in the American cotton growing States, but this fact must not be taken to signify that no trouble is experienced. In Dr. J. B. Smith's *Economic Entomology*, there occurs this pertinent passage:—

In the Cotton Belt there was no more troublesome insect, some years ago, than the Red Bug or Cotton Stainer (*Dysdercus suturellus*), so named from the fact that its excrement, voided in the opening bolls, stained the cotton red, and thus caused it to become of inferior value. Since cotton seed has become almost as valuable as the cotton itself, and is now completely used up, it has been found that these insects have become comparatively harmless. It seems that they were enabled to multiply unduly in the heaps of decaying cotton seed, and since at present no such heaps exist they cannot increase so rapidly

REMEDIES

The application of arsenate of lead or other arsenical to the plants attacked, so excellent a remedy for many leaf and fruit feeding insects, is of no value whatever as a check on the Cotton Stainer Bug since it derives its sustenance in fluid form from beneath the surface, and consequently would not take any of the poison into its system. Much more laborious measures are generally necessary to suppress a pest of its nature. The West Indian Entomologist, in the report alluded to above (*West Indian Bulletin*, Vol. VII., No. 1) says:—

In the West Indies two methods have been used with success. One of these consists of attracting the insects to baits, and killing them with hot water or kerosene. Cotton seed or pieces of sugar cane, placed in small heaps at frequent intervals throughout the field, have been used for bait. Cotton seed seems to be much preferred to sugar cane, and, scattered about the ginneries, it attracts large numbers of these insects, and may be made to serve as a trap. This method is likely to give the best results "between crops" when there is not much attraction for the insects on the plants. During the flowering and ripening period, however, the practise of collecting is likely to give the best results in controlling these pests. At this time the insects, young and old, are to be found on the cotton plants, and are frequently congregated on the bolls and tips of branches. The method of collecting is this: a bucket or kerosene tin, containing a small amount of water and kerosene, is used for catching the insects which are shaken or jarred off into it, the film of kerosene killing them quickly.

The Imperial Entomologist of India, in his account, says:—

When cotton was first grown on the Pusa Experiment Farm, this bug was very bad indeed; the plants were covered with the bugs, and as there was over twenty acres thus affected, there was every opportunity of testing remedies. They worked down to the simple method of collecting by hand, each coolie having a winnow in one hand and beside him a kerosene tin containing water and a little kerosene. Holding the winnow below the bolls or shoots on which the bugs were massed, a sharp shake dislodges the bugs into the winnow; a quick jerk brings them to one corner whence they are emptied into the tin. This method has since been in use when required. Naturally, all the insects are not obtained but the proportion is so high that it is practical extermination.

The last writer tested a number of spraying mixtures against the bugs, and found several decidedly effective, but only when used at strengths harmful to the plants. The mixtures were designed to kill by contact, not by being taken into the system through the mouth. The method of destroying the species found at the Rhodesia Cotton Company estate at Bamboo Creek is thus told in a letter from the Acting Manager received at this office a year ago:—

The best method we have hit upon, so far, is that of placing baits of cotton seed upon the ground, in each field under crop. The insects, in the evenings about sundown, gather in clusters on these heaps, and as they do not move about in the

morning until well warmed by the sun, effective spraying can be done immediately after sunrise and continued with good effect until nine or ten o'clock. By careful watching and systematic spraying, this pest can be kept well in hand, as the female bug deposits her eggs on the heaps of seeds, and the young, which are of a brilliant scarlet colour, are killed by the kerosene as soon as they make their appearance, if ever they do so. It is advisable, after spraying, to turn over the heap before passing on to the next one, so that fresh seed is exposed, and the trap is as good as formerly. For spraying I have found the "Abol" syringe, used with water into which a little kerosene has been put, the most suitable for the work.

Another measure of repression which has been advocated is to destroy most of the plants as early as feasible after the cotton has been harvested, but to leave a few here and there for the insects to gather on. These plants, together with the insects, are later destroyed with paraffine oil (kerosene) or by heaping dried grass, etc., about them and firing it. Professor Wallace suggests in a letter to the writer that it might be well to abandon cotton for a season when the pest gets very bad, planting the lands instead to maize and thus perhaps starving out the insects. This measure might prove advantageous in some places, but in the Colony and Transkei we are confronted with the fact that the pest has proved very troublesome in the first year that cotton was grown on farms where maize is the chief crop This fact suggests the idea that farmers who are troubled with the pest should be on the watch for native food plants which it may have in the veld and bush surrounding the lands which they plant to cotton. It may prove practicable to suppress many such plants. The *Solanums*, such as Cape gooseberry, wildling tomatoes, and bitter apples, and such like plants, should particularly be examined.

In one way or another Cape farmers should be able to master the pest, and for the common good of all it is requested that those who succeed satisfactorily will communicate their experience to the Department of Agriculture. As indicated in the opening paragraph the entomological staff has had no opportunity to study the insect, and these notes are designed merely to assist the farmer to gain a knowledge of its habits for himself and to suggest what measures of repression seem to offer the most promise

STOCK BOOK.

Some time back this Department received a request that a copy of a suitable stock book, or page of a stock-book, should be published in the *Agricultural Journal*, which stock-book, if taken up by the farmers, would enable them to keep an easy and a clear record of their flocks. This has accordingly been compiled The one sheet showing the stock account for January, 1909, is filled in merely to show how this is carried out. It naturally appears like a chapter of accidents, but this was thought desirable so as to demonstrate the use of every column The vacant sheet shows how the book would appear if printed Every two sheets would represent one month, that is, there would be thirty-one lines At the end of the year, by counting up the totals at the bottom of each individual column, any farmer would know exactly what number of stock he had lost and to what the losses were due, and also by noting the weight of the animals killed both for house use and for the farm hands, he would have a very fair idea when selling to a butcher -of the weight clean of his sheep and goats The daily account of the different flocks would, of course, be kept in a pocket book, and only the total of all the flocks kept in the stock book as here shown The figures in the stock-book could always be checked by adding all the increases to the original total and subtracting all the losses. This should then give the total of the date on which this balancing is carried out

STOCK ACCOUNT: January, 1909.

January.		Killed for labourers.	Weight in lbs.	Killed for House.	Weight in lbs.	Killed by Carnivora.	Died of Disease.	Lost (unaccount'd for)	Increase "Goats."	Increase "Sheep."	Stock bought.	Stock sold.	Labourers stock.	Total "Sheep."	Total "Goats."	Total of all Flocks on Farm.
1st	Total stock: 560 sheep, ewes, lambs and hamels; 580 goats, ewes, lambs and kapaters													560	580	1,140
2nd	Two old ewes "sheep" killed for boys, and 1 hamel killed for use in house	2	60	1	40									3	..	3
														557	580	1,137
4th	One goat killed by red cat, 1 goat lost, unaccounted for..					1		1						..	2	2
														557	578	1,135
6th	20 old ewes bought for slaughter stock and 100 buck ewes; the latter comprise 50 2-tooth and 50 4-tooth										120			20	100	120
														577	678	1,255
9th	Two old ewes sheep killed for boys and 1 hamel killed for use in house	2	63	1	42									3	..	3
														574	678	1,252
12th	Hired boy with 21 goats, comprising 8 ewes, 7 kids, 5 kapaters												21	..	21	21
														574	699	1,273
16th	Killed 3 old buck ewes for boys and 1 hamel for use in house..	3	75	1	38									1	3	4
														573	696	1,269
20th	Sent 50 kapaters, full mouth, and 30 old ewes; all fit for butcher, to stock fair, fetched 10s and 12s. per head respectively											80		30	50	80
														543	646	1,189
23rd	Killed 3 old buck ewes for boys and 1 hamel for house	3	73	1	43									1	3	4
														542	643	1,185
25th	Six sheep died of geilziek, dosed all with Cooper's and sulphur						6							6	..	3
														536	643	1,179
27th	Shepherd Jan left out 10 goats last night, 4 killed by jackals, remainder found					4								.	4	4
														536	639	1,175
30th	3 old buck ewes killed for boys, 1 fat old merino ewe killed for house	3	70	1	38									1	3	4
														535	636	1,171
31st	Sheep started lambing on 25th. 25 lambs up to date									25				25	.	25
														560	636	1,196
	Total	13	341	5	199	5	6	1	..	25	120	80	21	560	636	1,196

STOCK ACCOUNT

	Killed for labourers	Weight in lbs	Killed for House	Weight in lbs	Killed by Carnivora	Died of Disease	Lost (unaccount'd for)	Increase Goats	Increase Sheep	Stock bought	Stock sold	Labourers stock	Total Sheep	Total Goats	Total of all Flocks
Total															

EUPHORBIA LATEX AS AN ANTI-CORROSIVE.

By C. F. Juritz, M.A., D.Sc., Senior Govt Analyst.

Samples of Euphorbia latex or juice have occasionally been submitted to the Government Analytical Laboratories in order to ascertain their adaptability for the manufacture of rubber. Unfortunately it has never been possible to pronounce upon any such samples with unalloyed favour. About five months ago, however, while studying the problems involved in the manufocture of some paint that was supposed to be anti-corrosive, the possibilities of using euphorbia juice for some such purpose occurred to the writer who mentioned it at the time to the Under Secretary for Agriculture, submitting subsequently for Mr. Du Toit's information a copy of Newman's "Metallic structures: corrosion and fouling, and their prevention," on pages 297, 346, 347 and 348 of which some information on the subject is to be found. The juice in question is there described as "one of the most effective substances that have yet been largely applied in the manufacture of anti-fouling and anti-corrosive compositions." "It is only within about the last twenty years," the author further says,—(his book was published in 1896)—"that its remarkable preservative qualities have been occasionally applied to engineering purposes." He continues: "The discovery of its probable utility in the manufacture of paint was made during a surveying expedition in Natal, in 1870, it being then noticed, when the clearing knives cut the euphorbia spurge, a strong glutinous juice or gumissue adhered so firmly to the blades, that it was very difficult to remove, that iron so coated did not rust, and when immersed in sea water at Durban, no barnacles or marine life would touch it. In Natal, laths dipped in euphorbium juice were thrust into a white ants' (*Termes bellicosus*) nest mound, side by side with uncoated laths. In twenty-four hours the latter were found to be completely riddled, but the euphorbium-dipped laths were untouched. At St. Helena, it was noticed that even the moïst traces of this insect on tin cases caused very speedy corrosion of the metal, showing its great destructive powers. Timber coated with euphorbium juice had also been severely tested against the ravages of the *Teredo navalis* with success. It is also found to resist considerable heat, the cold necessary in making artificial ice, and ammoniacal and chemical vapours, without blistering or scaling, or other injurious action. In the manufacture of paint, the euphorbium, after undergoing several special processes, becomes a clear gummy juice of a darkish brown colour. This liquid is mixed with the necessary colouring material, etc., to which it gives a glossy appearance, while its own protective properties remain unimpaired. Euphorbium paint has undoubtedly many naturally valuable qualities, especially when applied to metallic surfaces, and the juice of euphorbium has a strong affinity for iron and steel. It is a reliable preservative against fouling, rust, and the corroding action of bilge water, is easily applied without preparation, and has no injurious effect on iron or wood or any substance

generally used for engineering purposes. It prevents marine worms, barnacles, and vegetation adhering to a surface coated with it until its protective qualities become exhausted by time; the bitter pungent juice of euphorbium paralyzing all efforts of marine and insect life. It maintains its quality in all climates, and retains its virtue for a considerable time, and is most tenacious, and yet elastic, for the prepared euphorbium can be drawn out to a thin rod. It does not blister, crack, or scale, and its viscosity is such that it will adhere to polished steel, tin, zinc, lead, and any smooth surface, and also to pipes buried in the earth. Brief reference to the use of euphorbium has been made, because it is the most important and novel substance, naturally possessing the necessary poisonous principle, recently introduced into the manufacture of anti-fouling and anti-corrosive compositions and paint for submerged or peculiarly exposed structures; and it is doubtful whether, for ships trading in any but very clean waters, and for submerged structures generally, there is a better material to employ, or one its equal for protecting the bottoms of vessels or any metallic surfaces from fouling and corrosion."

The Under Secretary referred the matter to the Cape Town Chamber of Commerce, suggesting that someone interested should procure samples of the juice of several euphorbias, from the Districts of Albany, Fort Beaufort, Somerset East, Jansenville, and others, and also that the Institute of Civil Engineers and the Imperial Institute should be communicated with in regard to the matter. The Chamber of Commerce was not then prepared with any more definite information on the subject than that it would be advisable to run the juice, if collected for practical use, direct into linseed oil, or turpentine, so as to prevent fermentation and coagulation, and that "Natives do not care to collect the juice on account of its caustic properties" Just wherein the special treatment to which Newman refers consists, however, it has not been possible hitherto to ascertain.

The subject was brought to the notice of Mr. C. H. Smith, A.R.I.B.A., of this city, and he was impressed with the possibility of the immense saving that could be brought about by the use of an efficient anti-corrosive in connection with metallic structures. He instanced the case of the Forth Bridge, where the corrosion is extremely rapid. A month or two later the writer happened to notice a special reference hereto in "Science Progress" of January, 1907, page 408, where it is said that according to the Secretary of the Forth Bridge Railway Company "The whole of the bridge is painted every three years, one-third being painted per annum. Special care is taken to see that all parts affected with rust are properly cleaned and that the paint is laid on a clean, dry ground, each coat being allowed to dry thoroughly before the next coat is applied. The paint used consists chiefly of oxide of iron, red lead and boiled linseed oil. Twenty-eight painters are continuously employed throughout the year, their wages amounting to £1,700. The cost of the mixed paint ready for use is about £20 per ton; about twenty tons are used annually. The part of the bridge most affected by corrosion is that from high water to a height of about twenty-five feet: such parts have to be dealt with more frequently than others."

This may indicate the opening that there would probably be for Euphorbia juice if it were to prove a satisfactory anti-corrosive.

The Somerset East Chamber of Commerce, on receiving the communication from Cape Town, wrote to London to the Trades Commissioner for the Cape of Good Hope, mentioning the fact that several kinds of Euphorbia abound in some parts of Somerset East, suggesting that it may be possible to utilise some of them for commercial purposes and requesting information as to the value of Euphorbium juice specially in the

manufacture of an anti-corrosive paint for engineering purposes. In response to this request Mr. Chiappini immediately instituted enquiries, the result whereof confirmed the statement that Euphorbium juice constitutes a very good preservative of iron against rust. The Trades Commissioner added that the juice, on account of its gummy nature, is not now used in paints, but that it is used by makers of compositions for ships' bottoms The demand seems to be gradually decreasing and the juice now commands a price varying from 13s. to 35s. per cwt. on the London market, the price being almost entirely controlled by the demand. The purer the gum, that is to say, the freer from small sticks and woolly matter, the better price it would command.

Mr. Chiappini went on to say that the article should be put on the market through produce brokers, as the manufacturers of these patent compositions invariably buy through brokers and never direct. He mentioned the following as handling Euphorbium juice: Messrs. Watts, Ltd., 72 Fenchurch Street, London, E.C ; Messrs. Godson and Winberton, 101 Leadenhall Street, London, E.C.; Messrs. Charles Andreas and Co, 34 Fenchurch Street, London, E.C.; and Messrs. Peall, Rog and Co., 5 Bury Court, St Mary Axe, London, E.C. He further advised that samples, consisting of a few pounds by weight of each variety of Euphorbium juice collected should be sent to his (The Trades Commissioner's) office; he would then submit samples to persons in the trade and, if possible, get valuations of the different varieties.

It need hardly be suggested that the juice obtained from each variety should be carefully kept separate by those collecting it, all the more in view of the probability that several South African species of Euphorbia are still botanically undescribed

CORRESPONDENCE.

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Irrigation at Tafelberg.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Your correspondent "Novice," writing in the July issue of the *Agricultural Journal* appears to wish for a reply, and, as one may be of interest to your readers, I shall ask you to publish this answer to his questions.

1. It does *not* require a dam 600 acre feet of water and a bore hole yielding 2,000,000 gallons per diem to irrigate only 200 acres of lucerne. I placed, in order to prevent any disappointment, a very low estimate on the area to be irrigated, as the Engineer's calculations were based on the *supposition* of the dam filling *once only in three* (3) *years* and getting *no additional water* into it during that period, a maximum allowance for evaporation and other losses, and a possible reduction in the flow from the bore hole. I hope in actual practice to *at least double* the above named irrigated area.

2. The pressure *was* considerable to give the "1½ to 2 million gallons" per diem, as stated in your article on this irrigation scheme in the May issue. The conditions of water pressure prevailing at the time the estimate of the flow from the bore-hole was made, were such as to make this flow possible. Of course without pressure this flow is impossible through a 6 inch pipe. The estimate of flow was made on the time taken to fill a "catch-dam" of known capacity, but the *actual calculated discharge* under the prevailing conditions would have been 1,750,000 gallons per diem.

3. It would, indeed, be a "poor chance for the general farming public" if *a constant supply* of "3,000,000 gallons per diem were capable of irrigating only 200 acres"—and I do not think you hinted at it in your article—I think it was stated that I intended to put down "at least 200 acres." In this country of uncertain and varying rainfall, and protracted droughts, it is best to err on the side of caution in estimating the amount of land that can be *thoroughly* irrigated from any given water supply.

I fear that I have trespassed unduly on your space, but I could not allow "Novice" to go unanswered, and I extend to him an invitation to visit the works in question.—Yours, etc.,

R. H. STRUBEN.

Tafelberg, 25th October, 1909.

S.A. Stud Book—Merino Sheep Section.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—The high quality believed to be possessed by all Merino sheep registered in the S.A. Stud Book is called into question by some, because it is alleged that the present rules are not of a sufficiently safe-guarding nature.

Of course in an undertaking such as the Stud Book Association has in hand it is utterly impossible to please everybody. At the same time no complaint can be passed over without the most careful examination. The present trouble is said to arise out of two causes. The first is, a want of faith by some in the principal of registering foundation flocks of Merinoes in the Stud Book proper. The second, the difficulty of getting a sufficient number of qualified examiners. I am writing now entirely for the Cape Colony section. Touching the admission of foundation flocks the original scheme for registering merinoes provided for an "Auxiliary Book"

wherein to enter all merinoes without a pedigree from some recognised Stud Book, but it was afterwards proved that breeders could not obtain pedigree sires much less ewes, because there was no Stud Book for Merinoes that could be recognised. As a consequence it soon became apparent that Merino breeders were utterly unable to procure pedigreed stock, while at the same time breeders of note refused to pass their stock through the Auxiliary Stud Book. This Auxiliary Stud Book by the way had no publication, it being more generally used for building up comparatively newly established breeds or new breeds of stock—at least that is the South African function of this particular book. As a result the best Merino sheep breeders considered them selves placed in an impossible position, and I proposed the formation of small nucleus flocks of only 50 ewes and 2 rams picked by highly qualified experts out of the old established flocks noted for their purity and possessing a satisfactory flock history. The idea being to select, as it were, the cream of the best flocks for registration in the Stud Book proper, with the proviso that the progeny be examined each year as well as future generations, the progeny stock to undergo the examination after they had fairly matured and so give defects an opportunity to show themselves. This proposition was accepted without one objection that I know of, but no sooner was it enforced than a number of breeders set to work and got the number extended from 50 to 150 ewes and 15 rams, and at the same time reducing the age limit of the progeny for examination. At the time I joined with those who pointed to the danger of such alterations, but as we all know the amendments were carried. All this happened some years back, but I sincerely hope the Merino breeders will recall the provision for entering their sheep as foundation stock, seeing the original trouble is removed, pedigreed sires now being obtainable which alters the whole position. It would be unjust on my part not to add that though it was proposed to enter only 50 ewes there were not 150 qualified in some of the best flocks, because there were a few stud flocks that did have the required number, and all of the right standard of quality. I admitted that at the time, and do so again, but speaking for the general welfare of the Merino section, the larger the number the wider is the door and correspondingly the danger of a wrong sheep getting in.

It is only repeating a truism to say that we cannot lay the foundation and complete the house the same day without running unwarranted risks. I am not prepared to say that perfectly unworthy sheep have got on to the Stud Book. I hope not. I do know several leading breeders who are desirous of raising the standard as well as close up every possible aperture through which anything unworthy may enter, and I believe at the next meeting of this section steps will be taken to further safeguard our most valuable industry.—Yours, etc.,

C. G. LEE,

President, S.A. Stud Book Association.

Klipplaat, October 3rd, 1909.

Superphosphate for Lucerne.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In your September issue I notice a letter re Superphosphate Manuring for lucerne, and would be pleased if you would answer the following questions:—

Is it necessary to put it into rich red soil, freshly stubbed.

How long will it act, or has it to be put in every season.

Where is it procurable.

I should esteem it a favour if you will insert this in your Journal, for the benefit of all interested.—Yours, etc.,

G. A. G.

Grahamstown, October 13.

(1) Superphosphate is procurable from Messrs. Tongue and Paterson, Port Elizabeth, and also from White, of Port Elizabeth.

(2) The effect of superphosphate lasts for a season, although it may probably last longer in soil which holds manures well. Basic Slag will, of course, last considerably longer. This is also obtainable from the firms already mentioned.

(3) Upon such soils as are in this neighbourhood we think phosphate will probably increase the yield even although used on new ground. Before trying it on a large scale it would be as well to manure, say, one acre or a strip across the veld at the rate of 400 to 600 lbs. per acre. If the result of this experiment is satisfactory then it might be used extensively.

Jansen's Prickly Pear Exterminator.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Kindly inform me through the medium of your paper where Jansen's prickly pear exterminator can be obtained. I see you have a favourable account of it in your October issue.—Yours, etc.,

"OPUNTIA."

Fort Beaufort, October 20.

The address is Mr. R. A. Jansen, Board of Executors, Graaff Reinet, C.C.

East African Draught Cattle.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In these parts I was much impressed by the fact that the oxen, though smaller than those of South Africa, are more powerful and more adapted for draught purposes. Their humps are larger and their neck and shoulder muscles are much more prominent than those of the South African ox. On looking for the cause of this I discovered that locally the bulls were also used to work similar to the ox, and thus it developed muscles which became the natural inheritance of its calves. Thus the local animal having inherited a neck more adapted for the yoke is easily broken in and is a more serviceable animal. It may be of some use to your readers who breed cattle for draught purposes to try this plan if they want better oxen for ploughing, etc.—Yours, etc.,

SOUTH AFRICAN

Uganda, September 29.

Cleaning Vessels after Locust Poison.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—There are probably very many farmers who have been doing what we are doing here—that is, using every available bath, etc., for soaking cut up green stuff for poisoning locusts. Can you tell me, through the medium of the *Agricultural Journal* how to clean these vessels and get rid of the poison.—Yours, etc.,

FARMER.

The obvious method is to scald them out with copious supplies of boiling water.

The Clarification of Honey.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I venture to enquire whether you, or any of your readers have knowledge of any method whereby honey can be clarified.

It appears to me, that of the large quantities of excellent honey produced in the Colony, the sale could be easily increased if it could be clarified to a clear light colour. I apologise for taking up your valuable time; my excuse being that I am interested in all Colonial productions, and would like to see the honey now being offered for sale, light and clear, instead of the prevalent dark, heavy hue.—Yours, etc.,

HERBERT CARTER.

Ashton, C.C., October 20.

The above matter was referred to Mr. H. L. Attridge, the well-known authority on apiculture, who replies:—I know of no process by which dark honey can be successfully "Clarified to a clear light colour." Honey being a natural product it cannot be tampered with like artificial compounds; exposure to light will bleach honey slightly, but the application of heat in any form will tend to darken it. Any

foreign substance introduced for the purpose of altering its colour alters the chemical properties and destroys the natural aroma. Repeated straining in a warm room will make dark honey lighter and more attractive in appearance. Some districts produce honey which by any present known methods cannot be improved or made suitable for table use, and the sooner South African bee-keepers recognise this, the better for the industry. This kind of honey should be sold for manufacturing purposes only

Red Poison—Government Strychinne.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In your September issue is a letter from H. J. Visagie, making complaints against what he calls "Red poison," i.e., Government supplied strychnine, and asking if any of your readers will tell him where to get good poison. Any respectable chemist can supply Mr. Visagie with pure strychnine if he is prepared to pay for it at a very much higher rate than for the Government supplied article Personally I have had experience with this "red poison," and have found it most effectual in killing dogs Out of 7 baits I put down I accounted for 6 dogs. The jackal may require a larger dose to kill him; but I may mention that it is not an unpopular idea that a too large dose acts as its own antidote, which is quite a fallacy. Let Mr. Visagie put in a sufficient amount of poison and I don't think he will again have cause for complaint Yours, etc.,

A R CRONWRIGHT

Trappes Valley, October 22

To the Editor, AGRICULTURAL JOURNAL.

SIR.—In your issue of the previous month I notice a communication of a correspondent with regard to the placing of poison and the bad results. Allow me a little room in your highly valued paper in order to acquaint you and also Mr. Visagie with my experience of the red poison. I wonder whether the poison, used by Mr. Visagie, is of the same kind which I keep. I have bought mine at the Magistrate's office, of Cradock, at 2s. 6d. per bottle, and during the last twelve months I have killed with it fourteen jackals and five dogs (which I have seen myself) besides those, which have taken the poison and which I cannot find, my farm being covered with bush. Perhaps they are dead in the dense bush, where of course it is difficult to get them. My way of placing the poison is as follows:- I use kidneys of a sheep or goat, cut them right through and cut a little hole in the core, put as much poison in it as goes on the point of a pocket-knife (two pills of one kidney). Further I take the paunch dung of a sheep or goat and put it on a soft spot, where I may notice the "spoor" of the animal, which takes the poison.—in order to enable me to know whether it is a jackal or some other animal,—I put the poisonous pill on the dung, and even cover the pill with a little dung. I never distribute poison at nearer distances than three hundred yards; else a jackal might pick up more than one pill, whilst others should not get any. On my farm I have found jackals on the spot, where the poison had been laid, and others at a distance of over five hundred yards from such spots, which I think is caused by some running away as fast as they can, after having taken the poison, whilst others keep on moving in a circle until they die.—Yours, etc.,

C. L. NEL.

Bultfontein, P.O., Dassiedeur.

To the Editor, AGRICULTURAL JOURNAL.

Sir.—In conection with the complaints of Mr. H. J. Visagie, Komkans, district Van Rhynsdorp, about the red poison for jackals, I wish to state that the red Government poison is as good as any to be had, but it is not prepared in the proper way. Mr. Visagie puts the poison in dead sheep; in such a case the jackal eats too much, and either the poison is too little in proportion to the quantity of meat, to be capable to cause death, or the jackal brings it up because his stomach is too full. There is an efficient way to use the poison, and when so used the jackal will not run away three thousand yards after having taken the poison. Take some melted tallow, ground or pound it as fine as dough, make balls of it of the size of a pigeon egg; powder the poison with your knife and take as much of it as covers the point of the knife; make a cut in each ball, and close it well after having put the poison in it. And then let the jackal have it. The best way is to place it where the jackal has previously eaten food. Poison, prepared in this way, may keep good in the veld for six months. I

usually place it underneath a bush, so that birds cannot see it. The jackal has a good nose and scents it. Put a small stick in each ball, and keep it over a fire, so that the smell of the hand gets away. If a jackal gets such a ball into his stomach, which then is empty, he cannot vomit it up, and he is doomed. If he catches some head of stock, allow him to consume that first; afterwards you may place the ball near the skeleton. He is sure to come back.—Yours, etc.,

CARL MEIRING.

Warmwater, P.O., Jan Fouries Kraal, Oudtshoorn.

Where the Tortoises go to.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I notice in your current issue an enquiry as to "Where do the Tortoises go" (Turtles). From my own experience I wish to give you the following, viz.: They burrow underground. If Mr. Turner will dig in the bottom of the pan when it is dry or in its vicinity he will find them. I often found them like that. Mr. Laubscher living on the farm Cloetskraal, near the Berg River, I remember ploughed up some, one a monster which I got, and was filled with eggs. The tortoises also deposit their eggs under ground. Trusting this will be of service to all.—Yours, etc.,

H. A. STIGLING.

Oostenkraal, October 23.

To the Editor, AGRICULTURAL JOURNAL

SIR,—I am surprised at Mr. Turner not knowing where tortoises go to in a dry season. I know for a certainty that they bury themselves in the mud, and as soon as it rains they come out again. Crabs, frogs, and fish do exactly the same thing.—Yours, etc.,

N. C. MUSTO.

Krom River, October 27.

Sweet Scented Vernal at Maclear.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Enclosed herewith you will find sample of grass for identification. It grows into very large tussocks. Cattle and sheep prefer it to cocksfoot. It grows through the winter, and our severe frosts have little or no effect on it.

Kindly insert a reply to this in the next number of your *Journal*, and oblige,—Yours, etc.,

"MACLEARITE."

The grass forwarded is *Anthroxanthum odoratum* (Sweet Scented Vernal). It imparts a very pleasant odour to a hay crop, and its presence enhances the price of hay in Europe. It is a true perennial, and grows very late into the autumn, so that the late crop is actually larger in bulk and more nutritious than the early crop. It is exceedingly hardy, and being good for grazing, should be encouraged.

Peculiar Sickness among Ostrich Chicks.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Kindly allow me a few lines in your *Journal*. A few days ago whilst visiting a neighbouring farm I noticed some sick ostrich chicks at the age of two and three months. They seem to get sick in no time, and die in about four or five hours after noticing them to be sick. Blood oozes out all over the body, even the legs, and upon examining them you can find nothing wrong inside that should cause their death.

Blood seems to ooze out as perspiration, as no marks or wounds are visible. Can you or any of your readers give any cause of death, and remedy to be used? These chicks were running in lucerne till they were about two months old. Thanking you in antipation,—Yours, etc.,

T. WATSON, JUN.

Biesenfontein, November 2, 1909.

We would be glad to have the full postal address of our correspondent, as this may be of importance. If any other readers have come across any sickness similar to this they should communicate with the Veterinary Department.

A Hefty Calf.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Last Thursday, October 28th, a Friesland cow presented me with a bull calf, weighing 98 lbs. (ninety-eight) when born, and at four days old he weighed 110 lbs. (a hundred and ten).

I should very much like to know if this is a record weight, it being the largest I have had.—Yours, etc.,

B. H. HARRIS.

Claremont, November 4.

We cannot say if this is a record or not, but it must be a very fine animal. Perhaps some of our correspondents can give the required information.

APPLICATIONS FOR AGRICULTURAL EMPLOYMENT.

Strong, healthy, Colonial youth, with several years experience of general Stock and Dairy Farming seeks employment. Knows Dutch well. Reply L. Liski, Henley Lodge, Three Anchor Bay, Capetown.

Student at Elsenburg Agricultural College requires situation on a Dairy or Stock Farm. Completing full course in December next. Took 1st prize for butter making at Rosebank Agricultural Show, 1909.—Apply, G. F. Fox, Elsenburg College, Mulder's Vlei.

*Elsenburg Student, 19 years of age, completing full course at end of year, desires employment on a farm.—Reply to H. W. Irwin, Elsenburg College, Mulder's Vlei.

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*Healthy young man (South African) 18 years old wishes to take to farming. Would like to hear of good opening, has had over one year experience on mixed farm.—Apply R. Desvages (Chemist) 141, Loop Street, Cape Town.

NOTES ON THE WEATHER OF SEPTEMBER, 1909.

By CHARLES M. STEWART, B.Sc., Secretary to the Meteorological Commission.

A mean barometric pressure slightly higher than usual and considerably above that for the previous month; a mean temperature warmer than usual, but with severe frost on 25th and 26th; a mean rainfall above the average, although deficient in the West and South-west; slight showers of snow and sleet, particularly on the first two days and 25th; a moderate number of thunderstorms, with a few showers of hail; cloudy skies and practically daily fogs, chiefly local; a practical absence of strong winds; such were the leading characteristics of the weather of September, 1909.

DIVISION.	Mean Rainfall (1909).	Mean No. of Days.	Average Rainfall (1891-1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	1·42	8	3·55	10	—2·13	— 60
South-West ...	1·14	6	1·99	6	0·85	— 43
West Coast ...	0·50	1	0·74	4	—0·24	- 32
South Coast ...	3·70	9	2·26	7	+1·41	+ 64
Southern Karoo ...	1·00	6	0·83	3	+0·17	+ 20
West Central Karoo ...	0·68	3	0·53	2	+0·15	+ 28
East Central Karoo ...	1·06	5	0·96	2	+0·10	+ 10
Northern Karoo ...	1·20	3	0·42	2	+0·78	+187
Northern Border ...	0·33	1	0·15	1	+0·18	+120
South-East ...	2·86	9	2·14	6	+0·72	+ 34
North-East ...	1·68	5	0·99	3	+0·69	+ 70
Kaffraria ...	3·58	10	2·05	5	+1·53	+ 75
Basutoland ...	3·05	6	1·22	4	+1·83	+150
Orange River Colony...	...	...	0·73	2	...	...
Durban (Natal) ...	6·21	15	3·49	...	+2·72	+ 78
Bechuanaland ...	0·45	2	0·40	1	+0·05	+ 12
Rhodesia ...	0·09	2	0·16	1	—0·07	— 44

Precipitation.—The mean rainfall, deduced from the records of 360 stations, amounted to 1·91 ins. on 6 days, being 0·24 in. or 14 per cent. above the average. This amount is 0·37 in. less than during the immediately preceding month, but 0·59 in. over the amount for September of the previous year. From the above table it will be seen that there was a large and serious deficiency over the "Winter Rainfall" area, amounting to one-third over the West Coast and two-thirds over the Cape Peninsula, with a small actual (but large percentage) shortage in Rhodesia. Over the rest of the country the surplus varied from *plus* 10 per cent. over the East Central Karoo to 187 per cent. over the Northern Karoo, the actual excess being greatest over Basutoland, Kaffraria, and the South Coast [as well as at the single station of Durban (Natal)]. Compared with August last and with September of the previous year, there is, curiously enough, a falling-off in both cases in the amounts recorded over the Cape Peninsula, South-west, West Coast, and Bechuanaland, but an increase over the other sections of the country. The practically general distribution of the rains is shown by the fact that of 373 records received only seven (7) report "Nil"; and only 50 had half an inch or less, making 15 per cent. that suffered from "absolute" or "partial" drought during the month; 68 had 0·51—1·00 in; 118 had 1·01—2 ins.; 58 had 2·01—3 ins.; 36

had 3·01—4 ins.; 15 had 4·01—5 ins.; 10 had 5·01—6 ins.; 6 had 6·01—7 ins.; 3 had 7·01—8 ins.; the remaining two largest amounts being 8·71 ins. at Blaauwkrantz (Division Knysna) and 9·77 ins. at Evelyn Valley; East London (East) comes third with 7·42 ins. Amounts exceeding 4 inches were confined to the South Coast, South-east, Kaffraria, Basutoland, and Durban (Natal). The daily intensity was mostly light to moderate. Thus, of 363 stations furnishing the necessary particulars, 144 (including those with "Nil") had 0·50 in. or less as the maximum daily precipitation; 113 had 0·51—1·00 in.; 88 had 1·01—2 ins.; 13 had 2·01—3 ins.; 3 had 3·01—4 ins.; whereas more than 4 inches was recorded by the two gauges at East London on the 15th, viz., 4·37 ins. at East London (East) and 4·35 ins. at East London West. The next largest amount was 3·09 ins. at Petrusville on the 13th. There was an increase in the number of *Thunderstorms* as compared with last month, but a decrease compared with September of last year—92 instances being noted on 13 days, principally on the 12th, 13th, 14th, and 24th. *Hail* was reported from 7 stations on 4 days, chiefly 14th. Slight showers of *Snow* fell at a number of the higher stations in the East and North-east, being reported from 21 stations on 4 days, notably 1st, 2nd, and 25th. *Sleet* occurred at 12 stations on 6 days, most widely on 25th

Temperature, Cloud, and Winds.—The mean temperature of all stations was 69·3° being 3·9° warmer than during August and 1·9° higher than during September of last year. The mean maximum temperature (69·9°) was 2·3° and 0·6° higher than the corresponding values for August, 1908, and September, 1909, respectively; similarly, the mean minimum (48·6°) was 5·4° and 1·3° warmer than the corresponding values for these same months. The mean daily range, 21·3°, was therefore 3·1° less than during the preceding month and 0·7° less than in September, 1909. Compared with the normals, the mean monthly temperature was 0·7° higher, the difference being mainly due to the night temperatures, which were 1·2° above the average, the day temperature being only 0·3° warmer than usual. At the individual stations the mean monthly temperature was above the average in West, South-west, and along the South Coast by amounts ranging from 0·2° at Sydney's Hope to 3·9° at Cape Town. In the South-east and in Kaffraria there were deficits varying from 0·5° at Port St. John's to 1·3° at Kokstad. In the interior the monthly temperature was mostly about one degree warmer than usual. The mean maximum (day) temperatures were above the average in the West and South by 1—4 degrees, the excess being greatest over the Cape Peninsula, and decreasing eastwards to 0·5° at Port Elizabeth. At the more northerly inland stations, the excesses lay between 0·5° and 2°; but became converted into deficits at those stations lying at short distances from the South Coast and in the more easterly portions of the Colony, varying from 0·6° at Sydney's Hope to 3·3° at Umtata. Similarly, the minimum (night) temperatures were mostly above the average by 1—2 degrees, ranging, however, from *plus* 0·3° at Kokstad to 3·1° at Concordia (Knysna) and Cape Town (S.A.C.). At a few stations, however, such as East London, Evelyn Valley, etc., there were small deficits of a few tenths of a degree. The mean warmest station was Mochudi (Bechuanaland) with 67·8°, and the mean coolest Disa Head (Table Mountain) with 52·5°, a difference of 15·3°. The highest mean maximum of 87·1° is found at Mochudi and the lowest mean minimum of 35·8° at Hanover. The highest readings for the month were registered on 12 days, mostly during a warm spell from 21st to 23rd, although a few were also registered on 4th to 7the, 16th to 19th, 24th, 25th, and 29th. The lowest temperatures were recorded during three cold spells, from 1st to 3rd, 5th to 6th, and 25th to 26th, but principally on the 26th, the last cold spell affecting practically the whole country. The mean of the higest readings (87·1°) is 5·0° higher than that for the previous month and 4·1° above the corresponding value for September, 1908. The mean value of the extreme minima (37·2°) is 3·0° above that for August last, but 0·5° lower than the similar value for the corresponding month of last year. The mean monthly range was therefore 49·9°. The extreme temperature values over all stations were 99·4° on 22nd at Dunbrody and 19·0° on 26th at Hanover, an extreme monthly range of 80·4°. *Frosts*, although much less numerously reported than during either last month or the previous September, were exceptionally severe, particularly those on the 25th and 26th, which caused considerable damage to growing crops of wheat, oats, barley, lucerne, etc., and practically destroyed the fruit crops in many parts. In fact, the intensity of this killing frost constitutes one of the main features of the weather of this month. In all, 36 instances of this phenomonon, were reported as occurring on 10 days, 2nd to 6th, 18th, and 24th to 27th. At Retreat (Cape Peninsula) the Grass Minimum fell below freezing point on 3rd, 4th, and 26th, reading 30·2° on the last date; the mean value of the readings of this thermometer was 42·4°, or 6·0° lower than the shade minimum. The mean percentage of *Cloud* was 46, being 10 per cent. more than during August last, but 3 per cent. less than the previous September. The skies were cloudiest in Kaffraria, South Coast, and South-east, where the mean amount varied from 59 to 54 per cent.; over the West, South-west, and Southern Karoo it was mostly about 45 per cent., decreasing to between 40 and 30 per cent. further inland, and falling below 30 per cent. in North-east and Rhodesia, but reaching the minimum of 14 per cent. over Bechuanaland. The skies were most obscured at Port St. John's, where the mean obscuration amounted to 74 per cent.;

and clearest at Mochudi, where the mean was only 10 per cent. *Fog* and *Mist* were almost twice as numerously reported as during August, 141 instances being noted on 29 days, principally from 11th to 16th and 28th to 30th. The only day on which this phenomenon was not noted was the 5th. The prevalent morning *Wind-Directions* were southerly (S.S.E. to S.W.) in the West, westerly along the coast to Port St. John's, and south-westerly at Durban; for some distance inland from the South Coast they continued W. to S.W., but were mainly easterly (N.E. to S.E.) over the interior portions of the South-east and Kaffraria; and N. to N.E. over the more northerly portions of the Colony, but south-easterly again at Hope Fountain (Rhodesia). The mean *Wind-Force* was 2·09, corresponding to a velocity of 13·45 miles per hour, being 1·30 miles per hour less than during August, but 1·40 miles per hour more than during September, 1908. The winds were strongest along the South Coast and in the South-west, decreasing slightly eastwards and inland, but were fairly strong over Bechuanaland and at Hope Fountain. At the Royal Observatory there was an unusual frequency of calms, the prevalent direction being southerly. These southerly winds, however, were slightly less frequent than usual, the only directions in excess of the average being those from S.S.E. and N W. The mean force there was only 0·97, corresponding to a velocity of 7·85 miles per hour or 3·9 miles per hour less than usual. Strong winds were comparatively infrequent, the force being reported as attaining the strength of a *Gale* at only 14 stations on 8 days, chiefly the 30th. *Hot Winds* occurred at 7 stations on 5 days, principally the 22nd, and *Duststorms* at 3 stations on 2 days. A manifestation of what was supposed to be the *Aurora Australis* was reported from Carnarvon Farm on the night of the 25th, being particularly brilliant from 9.30—11 p.m.

OBSERVERS' NOTES.

THE OAKS (Ceres).—The rainfall on the 25th will be fine for the lucerne just sown. Crops are looking splendid. Fruit orchard in full bloom.

VRUCHTBAAR (Wellington).—An ideal month for the blooming of fruit trees; never very hot or cold weather—beautiful sunny days. All kinds of fruit promise well, and cereal crops excellent.

PLETTENBERG BAY.—Drought broken. Veld and crops looking well.

UITENHAGE PARK.—Rainfall below the average, but, on the whole, a seasonable month. One hot wind, one white frost.

MUCH PUTFONTEIN (Aberdeen).—Drought beginning again, apparently.

NEW BETHESDA (Graaff Reinet).—Severe frost on 25th. All fruit destroyed, considerable damage to wheat and lucerne crops.

ROODE HOOGTE.—Very sharp frost on night of 25th. Fruit crop in district spoilt, and considerable damage to growing corn, etc.

THEEFONTEIN (Hanover).—Frosts occurred on 3rd, 4th, 5th, 6th, 26th, and 27th; that on 26th very sharp (ice quarter inch thick), doing great damage to fruit blossoms. The inch of rain on 13th was very acceptable. Reported that locusts are hatching out in some localities. Winds light and variable. Duststorm on 23rd.

VARKEN'S KOP (Middelburg).—Frost at beginning of month. S.E. winds and a good deal of moisture deposited at times. On 26th severe frost, which killed the budding grapes and figs and ruined a splendid crop of oats.

WAVERLEY (Queenstown).—Beautiful weather; very little wind.

DUNMURRY (Hay).—The frosts on 24th and 25th were severe, damaging vines, potatoes, and other garden produce

ALEXANDRIA.—Crops too young to report on. No prevalent disease.

ALIWAL NORTH.—Heavy frost during evening of 25th; doing damage to young crops and fruit in town and district.

CLIFTON (Sterkstroom).—Frost of 25th did very little damage. Veld looking well. Crops want more rain. Stock improving.

HERSCHEL.—Severe frost on 18th; fruit partly destroyed.

THIBET PARK (Queenstown).—Very severe frost on 25th, killing fruit, etc.

VENTERSTAD.—Sharp frost on 25th, which damaged or destroyed peaches, apricots, etc.

KOKSTAD.—Country looking beautifully green.

SLAATE.—Good lambing season.

TENT KOP (Maclar).—Several severe frosts, but little harm done, as there was very little wind and the ground wet; ground now beginning to get very dry.

ARMADILLO CREEK (Vryburg).—Taking into consideration that less than three-quarters of an inch of rain has fallen during the past four months, the veld is in good condition.

MASITIBITSANI (Motito).—River stopped running on the 15th.

NOTTINGHAME (Mafeking).—The sky towards latter end of month was often overcast, and on several occasions rain seemed imminent, but none actually fell. A cold wind from the South blew throughout the 25th, and was followed by a sharp frost, which proved most disastrous to orchard and vegetable garden.

"THE LANDS" (Richmond).—Very severe frost on 25th. Great amount of damage done to crops, fruit, etc., all being totally destroyed.

GROOT DRAKENSTEIN.—The temperature this month was considerably above the normal, whilst rainfall, wind and cloudiness were all much below. Except for the shortage of rain, the weather has been very favourable for farming. Mean temperature of month, 1·8° above the average; maximum temperature of month, 3·7° above the average; rainfall of month, 1·86 ins. below average, or only 37 per cent. of average.

CARNARVON FARM.—It will be seen from the subjoined table that the rainfall for the month is about half an inch above the last nine years' average. The fall for this month is always higgle-de-piggledy. Over an inch in 1902, "Nil" in 1903, and 5½ ins for 1905-6. The special feature of this September was the 10° of frost registered during Saturday night, the 25th. At 9 p.m. the grass was wet; at 11 p.m. it was soaking wet. These wet frosts seldom or ever do any serious damage This is an extraordinary exception. Can the supposed Aurora which was brilliantly visible here from 9.30 to 11 p.m. be responsible for this *Wet Frost* freak, as well as upsetting the world's telegraphs? Veld in good condition Water plentiful. Stock improving. All fruit destroyed, and thousands of pounds' damage to wheat; oats, etc. Barley, all stiff in pipe, is killed or damaged Lucerne badly wiltered. It is one of the worst "knock outs" we have had for some years.

	Rain	Wind.	Frosts	No Clouds
1901	2·25	10	2	0
1902	1·08	20	4	1
1903	0·00	15	11	3
1904	0·38	20	11	4
1905 ...	3·51	6	10	0
1906	1·94	8	6	3
1907	0·85	10	5	4
1908	0·43	11	6	3
1909	1·83	9	8	2
Means.. ...	1·36	12	7	2

Stations.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory ...	68·9	51·2	60·0	89·0	21	39·4	26
Cape Town (S.A.C.) ...	70·6	51·7	61·2	92·0	21	43·0	26
Blaauwberg ...	65·4	51·9	58·6	81·0	4	43·0	26
Table Mountain (Disa Head)	59·6	45·4	52·5	78·7	21	37·5	25
Do. (Devil's Peak)	64·2	47·2	55·7	86·0	21	38·0	25
Bishopscourt .	67·1	46·5	56·8	85·0	21	39·0	26
Wynberg ...	69 5	49·6	59·5	83·5	21	40·0	26
Groot Constantia ...	66·6	50·6	58·6	81·0	21	42·0	25
Retreat ...	68·3	48·4	58·4	79·6	21	38·0	26
Simon's Town ...	66·8	54·0	60·4	76·5	1	46·0	25 & 26
Danger Point ...	62·7	52·4	57·5	70·0	29	43·0	26
Robertson Plantation ...	71·7	47 4	59·6	90·0	21	34·0	25
Groot Drakenstein ...	72·2	47·7	60·0	92·3	21	39·0	26
Elsenberg (Agri. College) ...	69·5	48·1	58·8	88·7	21	39·9	2
O'okiep ...	72·9	45·5	59·2	92·0	21	36·0	1
Port Nolloth ...	66·3	49·0	57·6	91·0	16	40·5	2
Storm's River ...	68·3	49·3	58·8	93·0	22	37·0	26
Cape St. Francis ...	64·9	53·5	59·2	77·0	22	42·0	26
Van Staaden's ...	67·7	50·2	59·0	89·0	23	37·0	26
Uitenhage ...	73·7	48·8	61·2	98·2	22	33·5	26
Concordia (Plantation) ...	68·3	51·5	59·9	90·4	22	42·5	25 & 26
George (Plantation) ...	67·9	49·4	58·6	88·0	23	37·0	26
Dunbrody ...	75·0	48·1	61·6	99·4	22	31·8	26
Port Elizabeth ...	67·1	53·2	60·2	95·0	22	44·0	26
Cape Agulhas ...	63·4	53·1	58·2	72·0	4	44·0	26
Heidelberg ...	73·5	47·8	60·6	88 0	21	35·0	25
Amalienstein ...	73·8	45·4	59·6	95·0	22	35·0	2
Hanover ..	71·0	35·8	53·4	86·0	23 & 24	19·0	26
Kimberley ...	80·2	46·6	63·4	92·7	22	33·0	3
Lovedale ...	72·3	48·2	60·2	98 0	22	35·0	26
Stutterheim ...	68·3	48 1	58·2	90·2	22	34·5	26
Sydney's Hope ...	68·4	50·0	59·2	90·0	22	39·7	26
East London (West) ...	66·9	54·9	60·9	72·0	16	44·0	26
Bedford ...	69·5	46·6	58·0	92·0	23	31·0	26
Evelyn Valley ...	64·0	45·5	54·8	85·0	23	36·0	3
Chiselhurst ...	74·5	52·1	63·3	85·0	5	44·2	2
Aliwal North ...	74 0	42·3	58·2	87·0	23	27·0	26
Rietfontein (Aliwal N.) ...	68·3	42·4	55·4	81·0	23	27·3	26
Kokstad (The Willows) ...	67·6	43·4	55·5	82·8	23	30·0	26
Port St. John's ...	71·2	55·8	63·5	87·0	7	46·0	5
Tabankulu ...	67·4	46·9	57·2	82·5	22	31·5	3
Umtata ...	70·0	48·8	59·4	88·0	6	33·0	26
Mount Ayliff .	71·7	49·3	60·5	89·0	22	33·0	26
Main ...	69·3	47·3	58·3	88·8	22	32·5	26
Mochudi (Bechuanaland) ...	87·1	48·5	67·8	94·0	25	36·0	26
Kuruman ...	79·8	42·0	60·9	89·0	19 & 21	32·0	1 & 2
Hope Fountain (Rhodesia) ...	79·5	52·8	66·1	90·4	25	44·3	6
Means ...	69·9	48·6	59·3	87·1	...	37·2	
Extremes ...	...	...	...	99·4	22	19·0	26

RAINFALL, SEPTEMBER, 1909.

I. CAPE PENINSULA:

	INS.
Royal Observatory (a) 12in. gauge	0·78
Cape Town, Fire Station	0·61
Do. South African College	0·98
Do. Molteno Reservoir	1·20
Do. Platteklip	1·61
Do. Signal Hill	0·81
Sea Point, The Hall	0·82
Camp's Bay	0·65
Table Mountain, Disa Head	1·29
Do. Kasteel Poort	2·48
Do. Waai Kopje	2·73
Do. St. Michael's	2·85
Newlands, Montebello	·37
Kenilworth	·10
Wynberg, St. Mary's	·92
Groot Constantia	·34
Tokai Plantation	·15
Plumstead, Culmwood	·91
Muizenberg (St. Res.)	·45
Simon's Town, Wood	·60
Blaauwberg Strand	0·42
Robben Island	0·65
Maitland Cemetery	0·83
Tamboers Kloof	1·13
Woodhead Tunnel	2·06
Lower Reservoir	1·25
Maclears Beacon	2·98
Waai Vlei	2·68
Woodhead Dam	2·62
Retreat	0·81

II. SOUTH-WEST:

	INS.
Eerste River	0·91
Klapmuts	1·03
Stellenbosch, Gaol	0·93
Somerset West	1·27
Paarl	0·91
Wellington, Gaol	1·08
Tulbagh	0·81
Kluitjes Kraal	0·92
The Oaks	0·89
Rawsonville	0·43
Caledon	1·61
Worcester, Gaol	0·72
Hex River	0·25
Lady Grey, Div. Robertson	0·74
Robertson, Gaol	1·44
Do. Govt. Plantation	1·21
De Hoop	1·34
Montagu	0·96
Elgin Plantation	2·40
Elsenberg Agricultural College	0·89
Roskeen	1·82
Vruchtbaar	1·70

III. WEST COAST:

	INS.
Port Nolloth (Lieut. Barber)	0·15
Anenous	0·13
Klipfontein	0·33
Kraaifontein	0·15
O'okiep	0·12
Concordia (Krapohl)	0·24
Garies	0·35
Lilyfontein	0·60
Van Rhyn's Dorp	0·08

III. WEST COAST (*continued*):

	INS.
Clanwilliam, Gaol	0·33
Kersefontein	0·52
The Towers	0·60
Piquetberg	1·30
Wupperthal	0·22
Hopefield	0·48
Algeria (Clanwilliam)	1·85
Cedarberg (do.)	2·05

IV. SOUTH COAST:

	INS.
Bredasdorp	1·89
Swellendam	3·90
Grootvaders Bosch	7·35
Riversdale	1·95
Vogel Vlei	2·99
Mossel Bay	1·63
Great Brak River	2·50
George	5·04
Do. (Plantation)	5·27
Woodifield (George)	6·58
Millwood	4·68
Sour Flats	3·52
Concordia	4·54
Knysna	3·77
Buffel's Nek	7·02
Plettenberg Bay	3·03
Harkerville	6·34
Blaauwkrantz	8·71
Lottering	5·21
Witte Els Bosch	5·29
Humansdorp	4·23
Cape St. Francis	1·71
Witteklip (Sunnyside)	2·76
Van Staden's, Intake	3·04
Do. On Hill	2·98
Kruis River	1·45
Uitenhage (Gaol)	1·44
Do. (Park)	1·61
Do. (Inggs)	1·47
Dunbrody	1·65
Port Elizabeth (Walmer Heights)	3·31
Shark's River (Nursery)	2·91
Centlivres	1·36
Edinburgh (Knysna)	5·91
The Slip, Port Elizabeth	2·51

SOUTHERN KAROO:

	INS.
Ladismith	1·65
Calitzdorp	0·48
Oudtshoorn	0·70
Uniondale	1·15

VI. WEST-CENTRAL KAROO:

	INS.
Prince Albert	0·22
Zwartberg Pass	3·10
Beaufort West, Gaol	0.49
Dunedin	0·15
Nel's Poort	0·90
Camfers Kraal	0·48
Krom River	0·89
Roos Plaats	0·05
Lemoenfontein	0·48
Baaken's Rug	0·88

VI. WEST-CENTRAL KAROO: *contd.*

	ins
Willowmore	0·30
Rietfontein	0·34
Steytlerville	0·32

VII. EAST-CENTRAL KAROO.

Aberdeen, Gaol	0·84
Aberdeen Road	0·97
Kendrew, Holmes	0·96
Do.	0·82
Graaff-Reinet, Gaol	0·98
Do. (Eng. Yard)	0·88
New Bethesda	0·40
Roodebloem	96
Glen Harry	10
Wellwood	
Do. Mountain	·33
Bloemhof	·28
Jansenville	0·91
Roode Hoogte	0·71
Toegedacht	0.45
Klipfontein	0·91
Pearston	0·52
Middlewater	0·88
Somerset East, Goal	2·29
Middleton	2·05
Spitzkop (Graaff-Reinet)	1·82
Grobbelaar's Kraal	0·82
Muchputfontein	0·51
Zeekoe River (Aberdeen)	1·78

VIII. NORTHERN KAROO:

Calvinia	0·12
Sutherland	0 28
Fraserburg	0·28
Brakfontein	1·02
Victoria West	1·43
Britstown	0·84
Murraysburg	3·04
De Kruis, Murraysburg	2·55
Richmond	1·35
Hanover	0·20
Theefontein	1·00
Philipstown	0·90
Petrusville	3·09
The Willows (Middelburg)	0·57
Colesberg	2·00
Varkens Kop	1·63
Culmstock	0·93
Droogefontein	1·55
Cradock (Gaol)	0·50
Witmoss	0·82
Maraisburg	·60
Steynsburg (Gaol)	·24
Tarkastad	·87
Drummond Park	·32
Waverley	·40
Schuilhoek	·04
Vosburg	0·80
Zwavelfontein	0·75
Hartebeestfontein, Steynsburg	56
Willow Walk (Tarkastad)	41
Hotweg Kloof (Cradock)	0·44
Thebus Waters	1·59

IX. NORTHERN BORDER:

Kenhardt	0·05
Upington	0·00

IX. NORTHERN BORDER (*con.*)

	ins.
Trooilapspan	0·00
Van Wijk's Vlei	0·09
Prieska	0·00
New Year's Kraal	0·15
Dunmurry	0·07
Karree Kloof	0·35
Griquatown	0·68
Douglas	0·65
Hope Town	0·42
Newlands, Barkly West	0·29
Barkly West	0·40
Kimberley (Gaol)	0·80
Do. Stephens	1·00
Strydenburg	0·20
Douglas (Vos)	0 62
Rocklands (Herbert)	0·54

X. SOUTH EAST:

Melrose (Div Bedford)	0 09
Dagga Boer	1 41
Fairholt	0 40
Alicedale	1 28
Cheviot Fells	1 42
Bedford (Gaol)	2·34
Cullendale	2·19
Adelaide	1·72
Atherstone	2·06
Alexandria	1·71
Fort Fordyce	3·61
Graham's Town (Gaol)	4·00
Heatherton Towers	1·70
Sunnyside	2·58
Fort Beaufort	2·54
Katberg	1·80
Seymour	1·59
Glencairn	2·39
Lovedale	2·29
Port Alfred	2·58
Hogsback	4·83
Peddie	3·20
Exwell Park	0·79
Keiskamma Hoek	2·58
Cathcart (Gaol)	·62
Cathcart (Forman)	·78
Thaba N'doda	·52
Evelyn Valley	·77
Crawley	·33
Thomas River	·23
Perie Forest	3·61
Isidenge	3·99
Kologha	3·54
King William's Town (Gaol)	1·46
Fort Cunynghame	3·15
Dohne	3·00
Kubusie	3·62
Quacu	2·38
Blaney	1·20
Bolo	2·23
Fort Jackson	3·90
Komgha (Gaol)	4·23
Chiselhurst	5·41
Cata	3·58
Wolf Ridge	4·84
Dontsah	3·93
Mount Coke	2·90
Blackwoods	2·33
Albert Vale (near Bedford)	1·36
Huxley Farm, Stutterheim	2·91
Isileni (King Wms. Town)	3·45

XI. NORTH-EAST:

Venterstad	1·56
Mooifontein	2·45
Burghersdorp (Gaol)	2·05
Ellesmere	1·43
Broughton (Molteno)	2·39
Carnarvon Farm	1·83
Thibet Park	1.07
Sterkstroom (Station)	2·03
Rocklands	1·51
Aliwal North (Gaol)	0·98
Jamestown	1·65
Whittlesea	1·57
Queenstown (Gaol)	1·60
Rietfontein (Aliwal North)	1·21
Dordrecht	2·10
Herschel	1·84
Lady Grey	1·26
Lauriston	1·88
Lady Frere	1·67
Contest (Near Bolotwa)	2·17
Keilands	1·52
Barkly East	1·71
Cliftonvale	2·63
Hughenden	1·32
Glenwallace	2·16
Indwe (Collieries)	2·02
Hopewell (Imvani)	2·14
Sunnymeade	1·60
Clifton (Sterkstroom)	1·40

XII. KAFFRARIA.

	INS.
Slaate (Xalanga)	2·66
Cofimvaba	2·27
Tsomo	1·42
N'qamakwe	2·17
Engcobo	3·56
Butterworth	2·82
Woodcliff	3·27
Kentani	4·99
Maclear	2·77
Idutywa	1·50
Bazeya	6·40
Willowvale	6·08
Mount Fletcher	1·84
Somerville (Tsolo)	2·26
Elliotdale	3·02
Umtata	3·22
Cwebe	5·93
Tabankulu	4·01
Kokstad	3·58
Do., The Willows	4·29
Seteba	3·24
Flagstaff	5·15
Insikeni	4·19
Port St. John's	5·44
Umzimkulu	4·38
Maclear (Station)	2·83
Tabankulu (Atkins)	3·83
Umzimkulu	4·66
Tent Kop (Elands Height)	2·72
Elton Grange (Mount Currie)	3·37

XIII. BASUTOLAND:

Mafeteng	1·53
Mohalies Hoek	1·99
Maseru	3·89
Teyateyaneng, Berea	2·54
Qacha's Nek	5·29

XIV. BECHUANALAND:

Taungs	0·98
Vryburg	0·89
Setlagoli	0·00
Kuruman	0·19
Nottinghame (Mafeking)	0·00
Masilibitsani	0·51
Armadillo Creek	0·65
Mochudi	5·58

XV. RHODESIA:

Hopefountain	0·09
Rhodes Matoppo Park	0·10

Cure and Preventative

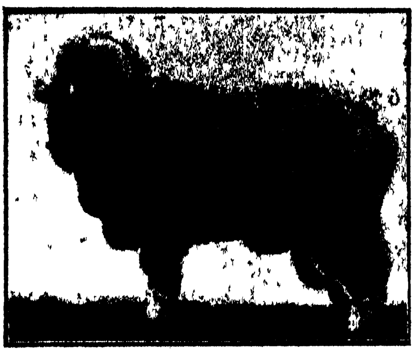
FOR

WIRE WORM

In SHEEP and GOATS

AND

PREVENTATIVE FOR TAPEWORM IN LAMBS.



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CAPE COLONY.

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M

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			C.											O.			
			Boer Meal											Fresh Butter			
			per 100 lbs.											per lb.	per		
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		
Aliwal North..	0 12 6	1 1 6	0 13 9	0 5 0	0 7 6	0 8 0	0 10 0	0 6 0	0 3 9	0 10 0	0 1 0	0 0 6	0 0 5	0 1 6	0 1 0	£10	15/
Beaufort West	0 15 0	0 18 0	0 14 3	0 6 3	0 8 0	0 9 6	0 6 4	0 6 0	0 5 6	0 14 0	0 0 8	2d to 3d.	1 to 3d.	0 1 6	0 0 9	£10	13/
Burghersdorp	0 13 6	0 18 6	0 16 3	0 5 9	0 7 9	0 8 0	0 10 0	0 6 6	..	0 8 0	w	0 0 8	0 0 4½	0 1 6	0 0 10	£12	15/
Cape Town ..	..	..							0 6 0	0 9 6	..			0 3	0 1 0	..	
Clanwilliam ..	0 12 0	..	13 0	0 14 0					..	0 9 0	0 0 9	0 0 7	5d to 6d.	0 0	6d to 1	7 10s	
Colesberg ..	..	..	..	..				0 7 6	..	..	..	0 0 3	0 0 9	0 6	0 1 0		
Cradock ..	..	..		0 6 0	..	..		0 5 9	0 4 0	0 7 6	0 0 6	.	0 0 4	0 6	0 1 3		
Dordrecht ..	0 11 6	0 19 0	16 0	0 6 3	0 8 3	0 8 0	0	0 5 0	0 6 0	0 12 0	0 1 0	0 0 3	0 0 4	0 3	0 0 6		12/6
East London ..	0 9 0	0 18 0	15 3	0 5 6	0 13 6	0 6 0	6	0 4 0	0 6 0	0 12 0	0 1 0	0 0 [illegible]	0 0 3½	0 7	0 1 0		19/-
Graaff-Reinet	..	..		..		..				..	..	..				..	..
Grahamstown	0 11 6	..		6 3		0 7 9	0 6	0 4 10		0 10 9	0 0 5	0 0 5¼	0 0	11	0 1 0	..	..
Kimberley ..	0 12 3	0 17 3		4 9		0 7 4	0 6	0 5 9		0 10 0	0 0 5½	0 0 8	0 0	5	0 0 10	£7 15s	11 3
King William's Town ..	0 8 6	0 17 3	0 15 3	0 5 6		0 5 0	0 7 6	0		0 12 6	0 0 6	0 0 4½	0 0	1	0 0 9	£12 10s.	17/6
Malmesbury ..	0 10 0	0 14 6	0 12 0	0 7 6		0 8 0	0 4 4	0		0 8 6	0 0 6	0 0 6	0 0	0	0 1 0	£12	16/-
Mossel Bay ..	0 12 0	0 18 8	0 15 9	0 6 3		0 6 0	..	0		0 9 0	0 0 4	0 0 5			0 0 9	..	
Port Alfred ..	0 13 0	0 19 6	0 17 6	0 7 0		0 7 6	0 10 0	0		0 10 0	0 0 6	0 0 7		4	0 0 6	£14	
Port Elizabeth	..	..	..			..	..		..	..	..	..			..		
Queenstown ..	..	..	..	0 5 0	0 12 0	0 8 0	0 8 0	0 5 0	0 3 6	0 12 6	0 0 5	0 0 5	0 0	0 9	0 1 0		
Tarkastad ..	0 12 0	1 2 0	0 16 0	0 5 6	0 13 0	0 7 0	0 5 0	0 4 9	0 4 6	0 9 0	0 1 0	0 0 4	0 0	0 9	..		
Vryburg ..	0 15 0	1 0 0	0 12 6	0 4 0	0 6 6	0 9 0	0 10 0	0 3 0	0 5 6	0 13 0	0 0 4	0 0 8	5d. to	0 3	0 0 9	£8 to £10	10/- to
Worcester ..	0 10 6	0 14 6			9	0 6 0	0 5 8	0 4 3	4 6 to 4 9	0 8 0				0 3	0 0 9	£5 to £12	12/- to

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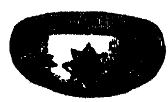
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18-ct. Gold, set 1 Fine Diamond, **37/6**

PRODUCE MARKETS.

CAPE TOWN.

R. Müller (Produce Department) reports for the month of October.—

Ostrich Feathers.—There is a very good demand, and prices for all good qualities are most satisfactory. Inferior qualities are being neglected. Quotations for Spadonas and Boos have receded from 5 per cent. to 10 per cent. For exceptionally good feathers fancy prices and being paid.

	£	s.	d.	£	s.	d.
Super Primes ...	19	0	0	33	0	0
First, ordinary to Seconds	11	5	0	17	10	0
Seconds	7	10	0	9	10	0
Thirds...	3	0	0	5	10	0
Femina Super ...	9	10	0	16	0	0
Do., Seconds to Firsts	4	10	0	11	15	0
Byocks (Fancy) ...	4	5	0	9	10	0
Long Blacks	2	15	0	6	10	0
Medium Blacks ...	1	10	0	3	10	0
Short to Medium ...	0	10	0	1	5	0

	£	s.	d.	£	s.	d.
Floss	0	7	6	1	15	0
Long Drabs	2	5	0	4	0	0
Medium Drabs ...	0	15	0	1	10	0
Short to Medium ...	0	5	0	0	15	0
Floss	0	5	0	1	10	0
White Tails	1	2	6	2	2	6
Coloured Tails ...	0	12	6	2	5	0
Chicks...	0	1	0	0	2	6
Spadonas	0	10	0	2	0	0
Inferior Black and Drabs, short to long	0	0	6	1	10	0

Wool.—Comparatively large quantities have been offered for sale in this market, and quantities arriving are increasing from week to week. Average quality is very satisfactory on account of the veld being good in nearly all districts. However, prices have receded, especially for inferior qualities.

The following are the highest prices obtainable at the present time.—Caledon, 9d.; Piquetberg, 7d.; Malmesbury, 7½d.; Roggeveld, 8¾d.; Karoo, 7½d.; Calvinia, 7d.

	s.	d.	s.	d.
Super long Grass Veld ...	0	6	0	9
Do. Karoo	0	6	0	7½
Medium	0	5	0	6
Short and inferior	0	3	0	4½
Wool for Washing	0	4½	0	6
Snow-white Super to Extra	1	4	1	8
Do. Ordinary ...	1	2	1	4
Fleece Washed	0	0	0	10

Mohair.—The rise which was expected has not been realised yet, and consequently the market still remains dull. Only small quantities have been offered hitherto.

	s.	d.	s.	d.
Firsts, Summer	0	9	1	1
Kids	1	6	1	9
Seconds	0	5½	0	9
Winter	0	8½	0	9½
Do. Kids...	1	0	1	2½

Hides and Skins.—The market remains strong. Good prices are being paid for all that is being offered. Of course, due allowance has to be made with reference to skins and hides which are not properly salted, or which have been damaged by bad cuts.

	s.	d.	s.	d.
Long woolled Skins ...	0	5½	0	6½
Short...	0	4	0	4½
Shorn	0	0	0	8
Bastards	0	3½	0	4
Cape Skins, each	2	3	2	8
Do., cut, each ...	0	0	1	3
Goat, heavy to light ...	0	10½	1	2½
Sundried	0	0	0	6
Angoras	0	5	0	6
Sundried Hides	0	6½	0	7¾
Salted	0	5½	0	7
Wet...	0	3½	0	4½

PORT ELIZABETH.

Messrs. J. Daverin and Co. report, under date October 29:—

Ostrich Feathers.—The market was fully supplied this week with the usual average assortment. Competition, although rather irregular, was active for all good qualities, average and common sorts showing little or no change. Stocks are being gradually

reduced, and new arrivals are limited The total quantity sold on the market during the week amounted to £16,380 11s. 8d., and weighed 6,712 lbs 15¼ ozs.

	£	s.	d.		£	s.	d.
Primes: Extra Super	Special Prices.						
Good to Super ...	20	0	0	to	35	0	0
Whites: Firsts ...	12	0	0	„	18	0	0
Seconds ...	4	0	0	„	10	0	0
Thirds ...	1	0	0	„	4	10	0
Feminas: Super ...	10	0	0	„	20	0	0
Firsts ...	6	10	0	„	10	10	0
Seconds ...	2	10	0	„	6	0	0
Thirds ...	0	10	0	„	2	10	0
Greys ...	1	10	0	„	7	0	0
Fancy	2	10	0	„	8	0	0
Tails: White	0	10	0	„	3	0	0
Light	0	10	0	„	2	10	0
[illegible]		0	6	„	0	15	0

	£	s.	d.		£	s.	d.
Blacks: Long .	1	15	0	to	7	0	0
Medium .	1	0	0	„	3	0	0
Short ...	0	4	0	„	1	0	0
Wirey ..	0	0	3	„	0	0	6
Floss .	0	5	0	„	1	7	6
Drabs: Long...	0	15	0	„	3	15	0
Medium .	0	10	0	„	1	10	0
Short... .	0	1	6	„	0	7	6
Wirey ..	0	0	3	„	0	0	0
Floss... .	0	5	0	„	1	10	0
Spadonas: Light ..	0	5	0	„	5	0	0
Dark ..	0	2	6	„	2	0	0
Chicks...	0	0	6	„	0	15	0

The following may be quoted as the approximate current values of unsorted parcels, per line —

	Whites.	Feminas.
Superior pluckings	£8 0 0 to £10 0 0	£5 10 0 to £7 10 0
Good Average lots	6 10 0 to 7 10 0	4 10 0 to 5 0 0
Poor Average lots	4 0 0 to 5 0 0	2 0 0 to 2 10 0
Common lots, stalky, narrow and discoloured	2 0 0 to 3 10 0	0 15 0 to 1 15 0

	Tails.	Blacks.	Drabs.	Spadonas.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d.
Good ...	15 0 to 17 6	20 0 to 40 0	12 6 to 15 0	30 0 to 40 0
Average ...	10 0 to 12 6	12 6 to 17 6	7 6 to 10 0	10 0 to 22 6
Poor ...	3 6 to 6 6	7 6 to 10 0	5 0 to 7 6	2 6 to 7 6

It will be understood that for special lots these quotations may be exceeded.

Wool. We regret to have to report no improvement in this market, and only a limited business has been done in the open market All good, light, well conditioned parcels are in fair demand on the basis of the reduced prices recently established; but heavy and wasty lots are quite neglected, and, to effect sales, low prices have to be accepted, which must leave severe losses to the up-country storekeeper. The position is aggravated by the fact that the wools now arriving, besides costing very high, are much heavier in condition than the earlier ones, and the Free State lots are also more or less badly infested with seed Owing to the large quantity offered, the Catalogue Sale was divided into two days this week. On Wednesday the offerings amounted to 2,400 bales, of which 692 bales were sold. Good wools showed no change compared with last week, but heavy and wasty wools were again quite neglected. On Thursday 2,000 bales were offered, of which only 310 bales were sold, the position being about the same as on the previous day. On the public market yesterday a fair quantity was offered, prices showing no change.

Snowwhite, Extra Superior ...	17½d to 18½d
Do. Superior	16½d „ 17d
Do. Good to Superior...	15½d „ 16d
Do. Inferior Faulty ...	12½d „ 13½d
Grease, Super Long, well-conditioned, Grassveld grown (special clips) ...	8½d „ 9½d
Do. do. do. ...	7½d „ 8¾d
Do. do. Karoo grown (special clips)	7¾d ,
Do. do. do. ...	6¾d
Do. do. Mixed Veldt...	7d .
Do. Light, faultless, medium Grassveldt grown ...	6½d „ 7¼d
Do. do. Karoo grown	6¾d „ 7½d
Do. do. short, do.	6d „ 6½d
Grease, Coarse and Coloured ...	2½d to 3½d
Scoured do. do. ...	1½d „ 3½d
Basuto Grease, short	6d „ 6½d
O.R.C. Grassveld Grease, long & well-conditioned (special clips)	7¼d „ 8d
Do. do. do. ...	6½d „ 7d
Do. do. medium grown, light, with little fault	6d „
Do. do. short, faulty & wasty	4½d „ 5½d
Do. do. Karoo grown, long & well-conditioned ...	6½d „ 7¼d
Do. do. medium grown, light with little fault ...	6d „ 6½d
Do. do. short, faulty and wasty...	4½d „ 5½d

Mohair.—This market continues steady, but the amount of business done in the open market has been rather limited, prices showing no change from those paid last week. On the public market on Tuesday a very large quantity was offered, consisting for the most part of mixed parcels. Competition was less active, and prices decidedly weaker than last week's.

Super Kids	22d to 23d
Ordinary Kids and Stained ...	15d „ 18d
Superior Firsts, special clips ...	12½d „ 12¾d
Ordinary Firsts...	11½d „ 12d
Short Firsts and Stained ...	10d „ 10½d
Superfine Long Blue O.R.C. Hair ...	10½d „ 13d

Mixed O.R.C. Hair (average)	8½d to	10½d
Do. very mixed ...	7d	8d
Seconds and Grey	5d	7½d
Thirds	4¼d	4¾d
Winter Kids, special clips ...	15d	15d
Do. good ordinary ...	13d	14d
Winter Hair	9¾d	10d
Basuto Hair	8½d	10d

Skins.—Sheepskins in bundles sold this week at 5½d., and Pelts at 4d. per lb.; Capes, 26d.; damaged, 7d. each; Goatskins, 13½d.; damaged, 7d. per lb.; and Heavy Goatskins, 8½d.; Angoras, 7½d.; Shorn, 5½d.; damaged, 3½d. per lb.; Johannesburg Sheep, 5¾d.; Goat, 8½d.; Angoras, 6d.; Springbok, 8½d. each.

Hides.—Sun-dried, 8¾d.; damaged, 7¾d.; Salted, 7¾d.; damaged, 6¾d.; Thirds, 3d.

Horns.—3½d. each all round.

EAST LONDON.

Messrs. Malcomess and Co., Ltd., East London, report for the month ending October 31:—

Wool.—The buoyant tone in the wool market exhibited during last month has not been maintained. We have all along been preaching caution, foreshadowing a reaction, which had to come sooner or later. It has come sooner than we expected. Shortly after the London sales closed news came that Australia had declined 7 per cent. This set the "Bears" selling in Antwerp, where Tops B rattled down from fcs. 5.75 to fcs. 5.30 in a few days. Bradfield has also been influenced, and Tops are now selling at 25d. for three months' delivery as against 28d. October delivery. In consequence of this check it is expected that the London sales opening on the 23rd November will decline 5 per cent. to 10 per cent. What will happen after that largely depends upon the attitude adopted by the trade in the forthcoming sales.

Locally the public wool sales have started again. On the 6th 1,300 bales were offered, on the 13th 2,200, on the 20th 2,700, and on the 27th 4,100 bales. In the first sales, and before the news about the weaker state of the market arrived from London, all good light wools fetched extreme prices. Since then, however, values have dropped fully 7½ per cent., in sympathy with the position obtaining over the water. Heavy losses have been made on the earlier purchasers, and it is not yet certain that values will be maintained at the lower level now established.

There is an enormous increase in Australia, calculated on a reliable basis at 100,000 bales, which will more than replace the expected decrease of 10 per cent. from the Argentine. South Africa may produce 10 per cent. more, which, however, is a mere drop in the ocean.

The following are local rates at the time of writing:—

7d to 7½d	**for very lightest and best Transkei and K.W.T. local Native Grease.**
6½d „ 6¾d	**for average genuine ditto.**
6d „ 6½d	**for average Native Grease.**
6d „ 6½d	**for average Basuto Grease.**
9d to 10d	**Up-country Grease—Super long light Kaffrarian Farmers and similar well-conditioned Wools (special clips)**
7½d „ 8½d	**Super short ditto**

Super long Light Skirted Farmers	7d to 8½d
Super short ditto	6½d „ 7½d
Good long well-conditioned Grass Veldt	6d „ 7d
Good short ditto, free from fault	5½d „ 6½d
Short, faulty and wasty... ...	5d „ 5½d
Long Fatty Grease, faulty ...	4½d „ 5½d
Short ditto ditto	4d „ 5d
Coarse and Coloured Grease ...	3d „ 4½d

Mohair.—There is very little change to report from here, and we quote as follows:—

12½d to 13d for superior long Blue Mohair, free from kemp.
10½d „ 11½d for average ditto., little kempy.
9¾d „ 10½d for sorted Basuto Hair.
9d „ 9½d for average ditto.
5d to 6d for Seconds.
3½d „ 5d for Dockings and Grey.
9¾d „ 10d for good average Winterhair.
13d „ 14d for genuine Super Winter Kids.

Sundry produce has realised the following:—*Hides*: Sun-dried, 9½d.; Dry Salted, 8½d. *Skins*: Goatskins, 13½d.; Angoras, 8½d.; damaged, each 7d.; Sheepskins, 5½d.; Pelts and Capes, 4½d.; Transkei and King William's Town parcels, 4½d. *Horns*: 2d. to 4d. each, according to size and quality.

BREEDERS' DIRECTORY & FARMING NOTICES.

Advertisements under this heading are inserted at the rate of 30 words for 2s. 6d., (minimum charge) per insertion, and 6d. per line of approximately six words above that number. Payment must accompany Order. Cheques and P.O.O. to be made payable to the CENTRAL NEWS AGENCY 125-127, Long Street, Cape Town, to whom all communications should be addressed.

OSTRICHES.

SPECIALS ONLY.—Choice pairs, £50 to £100 per pair.—F. W. BAKER, Laughing Waters, Willowmore.

OSTRICHES. — Young and old.—For further particulars, apply to Mr. R. S DE VILLIERS, The Imperial Cold Storage and Supply Co, Ltd., Porterville Road.

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BERKSHIRE BOARS.—Pure bred. Ages two to fifteen months. Bred by Charles Leonard, Esq on his well known "Gloria" Estate —For further particulars, apply to Mr. R S. DE VILLIERS, The Imperial Cold Storage and Supply Co., Ltd, Porterville Road.

PURE BRED BERKSHIRE PIGS.—Prize Winning Stock. Boars and Sows, £3 each. Also Buff Orpington and White Leghorn Poultry. —Apply MANAGER, Maitland River Farm, Green Bushes Hotel, Port Elizabeth.

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FRIESLAND BULLS, bred from the best IMPORTED stock, from few weeks to fifteen months old.—For further particulars, apply to Mr. R. S. DE VILLIERS, The Imperial Cold Storage and Supply Co. Ltd., Porterville Road.

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GENERAL.

PASPALUM GRASS PLANTS.—Strong roots per Rail or smaller plants per Post to any address. See larger advertisement, page ix. this Journal.—A. C. BULLER, Dwarsrivlers Hoek, Stellenbosch.

LUCERNE AND ALL FARMER'S SEEDS

Samples and Prices on application.

D MULLER & CO., Seedsmen,
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BUFF ORPINGTONS, SILVER WYANDOTTES, BLACK MINORCAS, Winners of over 90 prizes. Bred for Utility and Show points. PULLETS from 10/-, also COCKERELS from 7/6. Will improve the table and laying qualities of common fowls. Mrs. R. F. DOTT, Kenilworth, Kimberley.

R. W. HAZELL, Tregenna, Park Road, Rondebosch, Breeder of High Class Exhibition and Utility White Wyandottes, Black Orpingtons and Houdans. Wyandottes a speciality. Eggs and Stock for Sale Inspection and correspondence invited. Many testimonials from pleased customers.

WHITE LEGHORNS.—Best American Utility Strains. Settings of Eggs for sale, from pure-bred utility White Leghorns, F.O.R., 10/6 per setting of 15. Cockerels, 10/- to 20/-. Terms, cash with order. Mrs. W. L. STEEL. Stellenbosch.

BUFF ORPINGTONS. — THE FARMER'S FOWL. The fowl that LAYS WHEN EGGS ARE TOP PRICE. A 1 TABLE BIRDS. My Buffs have unlimited orchard and grass run, and are noted for hardiness and good laying qualities. Young stock always for sale at very reasonable prices Ask for inclusive quotations; carriage paid to any station in South Africa and AT MY RISK to rail destination. My list of prizes won at shows all over South Africa will convince you that this unrivalled *Colonial* strain of 10 years' standing CAN HOLD ITS OWN AGAINST IMPORTED STOCK. Buy hardy Colonial-bred birds and save your pocket. Address: A. C. BULLER. Dwarsriviershoek, Stellenbosch.

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Queens, Nuclei and full Colonies from selected African, Golden Italian and English stocks. Send for Illustrated Catalogue of Hillsworth Apiaries, Retreat, Cape Colony. Please name this paper.

THE

Agricultural Journal

OF THE CAPE OF GOOD HOPE.

No. 6. DECEMBER, 1909. VOL. XXXV.

Published Monthly in English and Dutch by the Department of Agriculture and distributed gratis to bona fide farmers in the Cape Colony on application through the Resident Magistrate of the District.

SUBSCRIPTION 3s. PER ANNUM. Post Free in South Africa.
Remittances to be made Payable to the Publishers CAPE TIMES, LTD., Church St., Cape Town.

Advertising.—Approved Advertisements are inserted. Full particulars can be obtained from the Sole Advertising Contractors, THE CENTRAL NEWS AGENCY, LTD., 125-127, Long Street, Cape Town—P.O. Box 9—Telephone No. 438—Telegraphic Address: "Periodicals"—to whom also all accounts must be paid.

Postal Address:
The Editor "Agricultural Journal," Department of Agriculture, Cape Town.
Telegraphic Address: "Bulletin," Cape Town.

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NOTES.

Amarantus Weed (Alternanthera echinata, Sm.).

In the September issue of the New South Wales *Agricultural Gazette* the noxious weed "Alternanthera echinata, Sm.," known in Cape Colony as the "Amarantus Weed" and in the Transvaal as "Khakiweed," is credited as being a South African plant. This is not so. It was introduced during the war, probably in forage from the Argentine, the plant being of tropical American origin This plant has been proclaimed under the Noxious Weed Act in the following districts:—Kimberley, Vryburg, Somerset East, Transkeian Territories, and Pondoland.

Salt Bush Seed.

Mr. Herbert Alston, of Van Wyk's Vlei, writes that owing to the exceptional floods there in the autumn salt bush seed was unobtainable, so many applicants were disappointed. It is gratifying to learn, however, that the supply of seed (*Atriplex halimoides*) is now plentiful, therefore those in need should apply sharp to Mr. Alston.

Transvaal Agent for Cape Produce.

Attention is again drawn to the fact that Mr. A. Webb, of Johannesburg, has been appointed as agent for the sale of Cape produce in that market. This arrangement was completed some time back under guarantees with the Colonial Government. Mr. Webb, we may add, also acts as agent for the sale of live-stock.

Removal of Sheep from the Cape Colony to the Transvaal.

The following course has in future to be adopted in regard to the admission of sheep from this Colony into the Transvaal, viz.:—

1. All sheep consigned to the Transvaal will require to be accompanied by a certificate, issued by a Cape Sheep Inspector not more than ten days prior to the date of entraining, to the effect that such sheep are free from scab.
2. Certified "clean" sheep which may become infected *en route* will be dipped at Christiana and thereafter forwarded to their destination.
3. Owners will be charged at the rate of 1s. 6d. per 100 sheep dipped, which charge will include cost of inspection, dipping and use of the tank and labour at Christiana.
4. Before consignments of sheep for the Transvaal can be accepted, the owners or consignors will be required to produce to the Stationmasters at the loading stations the certificate prescribed in Clause 1.
5. The Transvaal Government will not permit the introduction of any sheep which are not accompanied by an Inspector's clean certificate.

Lucerne.—Pasturing v. Harvesting.

Its perennial nature and the reports of its wonderfully productive and nutritive qualities might naturally lead the farmer, without better acquaintance, to suppose that in alfalfa (lucerne) he has perpetual pasturage; that he will open the gate to his live-stock in the spring, send for the butcher or buyer in the autumn, and then winter in luxurious leisure. But he finds that the easiest is not always the most profitable way. Pasturing with any stock is an expensive and extravagant method of gathering a valuable crop from high-priced land. Where land is cheap and pasture is wild, stock are not expensive help in gathering a cheap crop; but it is easily demonstrated that when land values are high and a crop value is in like altitude, man with machinery can do the harvesting more economically than can a cow, a steer, or even a sheep.—From Coburn's "The Book of Alfalfa"

The Feeding Value of Lucerne.

The feeding value of alfalfa (lucerne) is largely in its chemcial compound, known as protein; its extreme digestibility is another desirable quality to be considered, and not least is its appetising character. Not only do all animals like it, but when given in moderate quantities it seems to increase the general appetite for more fat-making feeds. Steers beginning to "fall off" on a heavy diet of corn will come to their appetites after being fed only a few pounds of alfalfa daily, and will eat and assimilate more corn than before Alfalfa alone is not a fat-making feed. Animals fed upon it grow in weight, but the weight is principally of bone, blood, and muscle. It is without a sufficiency of fat and carbohydrates, and these should be added in such feeds as corn, mealies, corn meal, Kafir corn, or Kafir corn meal; or to a limited degree even in corn stover, sorghum, or millet. When alfalfa is fed alone all the protein cannot be digested, and, therefore, it is always economical to add some carbonaceous foods, if animals are to be fattened —From Coburn's "The Book of Alfalfa."

Green Manures and Potatoes.

"Agriculturist," writing from Maclear, asks which is the best kind of green manure to use for potato raising. In reply the Government Agriculturist forwarded the following memo.:—With regard to the potato fertiliser, I may state that there is no green manure which is really suitable for potato growing, that is by itself. Green manure adds a quantity of nitrogen and humus to the soil, and greatly improves the mechanical condition. The quantity of potash and phosphoric oxide added is only that which has been taken from the soil by the plant, and these ingredients are therefore not increased. Potash and phosphoric oxide are especially required in potato growing, and an excess of nitrogen will increase the leaf growth, but if you can use green manure and then add potash and phosphoric oxide to your soil you would undoubtedly be able to raise an excellent crop. If you are in a position to do this, and will send me a sample of your soil I shall endeavour to work out as nearly as possible what fertilisers you will require. Of course, the fertiliser that will give you the best results can only be ascertained by experiment, but such experiment will be very simple, and one that you can easily carry out on your farm.

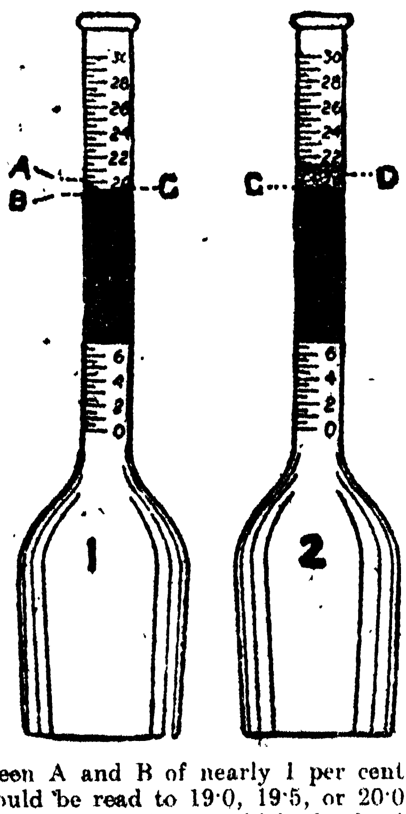
An Experiment in Agricultural Education.

An Eastern correspondent writes:—It is not easy to decide what is the best course to pursue for the education of a boy who hopes to make farming his work in life. Should he leave school early and go to an agricultural college? Should he go on with the ordinary school work until he can get through Matriculation perhaps as late as the age of nineteen, and then go on to a farm? Or should he go late to Elsenburg or elsewhere? These questions are not to be lightly answered, but surely it must be conceded that no boy ought to specialise before he is about sixteen and has acquired some amount of foundation To put it in other words, he ought not to specialise until he has learned how to learn An attempt is to be made by St. Andrew's College, Grahamstown, next year to provide a practical answer Like all attempts, it is an experiment that may or may not succeed, but it is well to know its aim and on what it is founded The progressive farmer of to-day deplores the lack of general education and consequent lack of interest in outside matters which prevail to some extent on South African farms. Boys, he argues, must be taught something of their language and literature so that they may be put in the way of acquiring a taste for reading and a wide interest in things which will last them during life. They must have material to entertain their minds during the long evenings when work is over; and this material must be foreign to their ordinary occupation. All work and no play is never to be commended. Similarly, continual thought and talk about nothing but the farm is apt to make a man dull.

It is proposed, therefore, to devote a good deal of the time of boys in the new "agricultural course" to English Literature and History. They will, of course, keep up Science and practical Mathematics—but other subjects will disappear from their routine, and they will devote the time to subjects which it is hoped will be of direct use whether they go straight from school to the farm or whether they proceed to an Agricultural College. Certain subjects will be taught regularly: business methods and bookkeeping; farriery, land measuring and the principles of irrigation; carpentry and fencing: soil analysis and planting. These are to be as practical as possible. Other subjects will be taught in course of lectures and series of demonstrations which friends and old students of the College have kindly come forward to give. Demonstrations on practical horticulture will be given at the nurseries of Messrs. Gowie and Sons by Mr. William Gowie. Mr. T. T. Hoole, jun., will teach picking up of fleeces, skirting, rolling and classing of wool. Mr. George White will from time to time give instruction on ostrich feathers. Advocate Barry has undertaken lectures on elementary law. Mr. Mally, the Government Entomologist, has promised lectures and demonstrations on insect pests, and courses of lectures and demonstrations on other subjects will be arranged as opportunity offers. Some prominent Albany farmers have formed a kind of Committee under the President of the Upper Albany Farmers' Association (Mr. T. T. Hoole), and will do their best to keep the instruction on the right lines. St. Andrew's is not in the least professing to set up an Agricultural College—it has neither the necessary staff nor equipment—but it is endeavouring to put boys on to the systematic study of those subjects which will be with them through life and at the same time to maintain and improve their literary and scientific attainments.

New Method of Reading Cream Tests

One of the important points in testing cream by the Bebcock test is to measure the fat accurately after it is separated in the neck of the test bottle. The bottom of the fat column is approximately a straight line, but the top has a concave surface, or meniscus, which often occupies a space of nearly 1 per cent. of the graduated scale on the neck of the bottle. Considerable discussion has arisen as to whether the fat should be read to the top, the bottom, or to some other point on this meniscus. Experiments have been made by the dairy division of the United States Department of Agriculture for the purpose of locating accurately the proper point for reading the top of the fat column This uncertainty can be entirely overcome by dropping a small quantity of alcohol into the neck of the test bottle after the cream test is completed. The alcohol floats on the fat and changes its concave surface to nearly a straight line. This use of alcohol has long been known, but as alcohol dissolves fat, the practice is not to be recommended, as it reduces the length of the fat column somewhat, and therefore gives too low a reading of the per cent. of fat.



The suggestion has recently been made by Dr. Babcock that this solvent action of alcohol on fat can be overcome by first adding to the alcohol all the fat it will dissolve, and then pouring a small quantity of this fat-saturated alcohol on the top of the fat column in the test bottle. This method of reading the fat in cream testing has been in use for some time at the Wisconsin Dairy School with very satisfactory results. The top and the bottom of the fat column appear as nearly straight lines, giving two exact points between which the fat can be measured. The diagrams illustrate the difference in appearance of the top of the fat column before and after using the fat-saturated alcohol. Bottle No. 1 shows the top meniscus of the fat which occupies a space between A and B of nearly 1 per cent. on the scale. The test of this cream could be read to 19·0, 19·5, or 20·0, depending on the selection of A, B, or C, as the point to which the fat is read. Bottle 2 shows the appearance of the top of the fat column after the fat-saturated alcohol has been added. The alcohol (D) makes a nearly straight line at the top of the fat column, so that the test can be read at the point C without any uncertainty as to the height of the fat column.

The fat-saturated alcohol is prepared by adding about a teaspoonful of butter fat to six ounces of alcohol in a bottle. Warm and shake the bottle until the alcohol has dissolved all the fat possible; some of it will be left

undissolved at the bottom of the bottle. We have found it convenient to remove the fat-saturated alcohol from the bottle by means of a glass tube which extends through the cork to near the bottom of the bottle By placing a finger over the top and lifting the tube out of the bottle, a small quantity of the liquid can readily be transferred to the cream test bottle This fat-saturated alcohol should be used for reading the tests as soon as they are completed, while the fat is still liquid. A little shaking of the test bottle after adding the alcohol will sometimes make the line between the fat and the alcohol more distinct.—Prof E H. Farrington, University of Wisconsin.

Irrigation Enterprise in the North-east.

Mr. W. F Smith, of Aliwal North, writes.—A few months ago I had the opportunity to visit Mr. Jacobus Joubert's farm Draai Dam, situated on the bank of the Orange River, about seven miles from Bethulie. He

was then nearing completion a work which had taken him three years, and for which he deserves great credit. I shall now briefly give a description of his water scheme, which he carried out alone, without the assistance of an engineer, nor was he supported by his Government. Nature provided Mr Joubert with a beautiful island nearly a hundred morgen in extent, covered with willow and other trees and splendid grazing for stock. It is at this ideal spot our enterprising farmer made his weir, which is 120 (one hundred and twenty) yards long, 16 (sixteen) feet wide at the bottom, and 9 (nine) feet at the top, and 8 feet 2 inches (eight feet two inches) high, across the Orange River. The weir is made entirely of stone, no cement being used, and is laced together with strong steel wires, while six $\frac{3}{4}$-inch steel ropes run across on the lower side of the weir, and these are anchored

at several places on the upper side of the weir, so that it seems impossible for his wall to give way. The stones for this work were conveyed on an aerial trolley worked by one donkey.

Now we come to a huge furrow 400 yards long, about 17 feet deep, and 9 feet wide, and it seems to me that this work required more labour and skill than the weir, as 300 yards of it had to be cut through dolerite. Mr. Joubert informed me that it took 200 charges of dynamite to blast each yard of rock, which was 9 feet thick, and on an average he had to sharpen fifty drills a day. Here our enterprising farmer made good use of the donkey and pulleys in hoisting the stones. It is in this furrow that the water wheel is placed, and is now using its 30 horse-power to drive two 4-inch high lift pumps, which deliver 12,000 gallons per hour. Mr. Joubert intends adding a 6-inch centrifugal pump, which will give a further supply of 49,000 gallons per hour. The water wheel is 9 feet wide by 13 deep, and is beautifully balanced and will work with a small flow of water. I suggested to Mr. Joubert to lower his furrow about two feet and then to put up another water wheel, which will double the supply: this he will certainly do in the course of time. The water is thrown up a distance of 60 feet through 270 yards of piping, and may be led direct on to the lands or into a huge dam. I must here mention that Draai Dam is 4,000 morgen, and has four or five hundred morgen of level lands on the bank of the river. The soil is fertile, and just the thing for lucerne. The above is an object-lesson to farmers on the banks of rivers, and great credit is due to Mr. Joubert for his enterprise. The O.R.C. Government should give him a substantial bonus. He has shown what can be done by an individual farmer who had to fight his way through adverse currents, and when he tackled his scheme was considered by many of his brother farmers to be going off his head.

Farm Telephones in the Transvaal.

In connection with the inquiries set afoot by the S.A. National Union with reference to farm telephones in the various Colonies, the Acting Postmaster-General of the Transvaal gives the following further details of proposed extensions in that State:—It is intended to erect main trunk lines, to communicate with Pretoria and the Rand from Klerksdorp, Volksrust, Belfast, Zeerust, and Pietersburg. Connected with these main routes will be a large number of subsidiary trunk lines, and when the whole are erected it will be possible to speak easily from one end of the Transvaal to the other. Few farms will be far removed from a line when this programme is completed, and connections with farms will be given to the nearest available point on the lines. All connections will be taken to an exchange. The exchange fixed charge of £7 10s. per annum will be payable by all subscribers, and the only addition to this for farmers will be 10 per cent. of the cost of their lines outside the exchange areas, existing lines being used as far as possible to minimise this cost. If, for instance, a farm is 10 miles from an exchange, a trunk line from the exchange passing within 2 miles of the homestead, the charge would be £7 10s. for the exchange service, covering a line of 1 mile from the exchange as centre; for 7 miles the circuit would be carried on the existing line and for the remaining 2 miles a light line would be run across-country to the homestead, 10 per cent. of the cost of this construction outside the exchange area being added to the subscription of £7 10s. If two farmers become co-renters of a circuit, or if the cross-country line serve two or more farms, the yearly cost will

be correspondingly lowered. In practice it will be found that this system of charge will lead to cheap telephones. Private lines between farms will also be erected, if required; but it is found that nearly all farmers wish to use the trunk lines to get into communication with their markets. The yearly subscription will cover a service to all their exchange subscribers, but for trunk line services there will be a charge of 3d. per conversation over each 25 miles of line. The arrangement in regard to these charges is experimental, and as soon as possible a fixed scale will no doubt take its place

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Sickness among Ostrich Chicks.

Professor Duerden writes - Ostrich farmers generally must have been much interested in the letter from Mr. T Watson, which appeared in your last issue under the above heading. So far as I can gather, the trouble described is something new, and adds one more to the many diseases and ailments of the ostrich calling for thorough investigation. I was particularly interested in the communication, as only a few days previously I had received a letter from a correspondent, Mr. Arthur Taute, Selborne, P.O. Addo, describing what seems to be the same trouble Mr. Taute wrote that chicks about three months old and running on lucerne were suddenly seized with a sickness which showed itself by minute drops of blood appearing on the head, as if from a prick or fine puncture, though no injury could be seen The chicks were feverish, and would die in two or three days after being attacked As a remedy he had given all of them a strong purgative In Mr. Watson's cases it is stated that blood oozes out all over the body, even the legs. In reply to Mr. Taute I stated that the sickness was evidently something new, but that without proper investigation one could not say much as regards its cause or remedy. I considered that he was doing wisely in giving the chicks a purgative, and recommended taking them off the lucerne except for two or three hours each day, as evidently the birds were over-stimulated. Mr. Taute now writes to say that since his first letter he has had no more chicks sick. His treatment may be helpful to other farmers. As a laxative he used raw linseed oil and kept the chicks out of the lucerne, on the veld, for part of the day. The dose for chicks three months old was about three tablespoonsful, and at the same time they were kept out of the hot sun as much as possible.

Mr. J. E. Campbell, of Steytlerville, writes:—*Re* sickness in ostrich chicks, said to be caused by eating what they call in Dutch, *Keessie or Keessen bladeren.* I lost one chick last year four months old, and have two now suffering in the same way a little over two months old. They become weak and staggering, and soon become so bad that they cannot feed on the ground or stand still. They have always to keep on the move or they tumble over, when sitting down, that is after they first had a tumble. They feed all right. As far as I know they succumb to the disease in a month to two months' time, some may last longer, but eventually die. Can you or any of your readers give any remedy to be used?

Another correspondent, Mr. Frank Diederiks, of Willowmore, writes, asking if anyone can tell him what he can use for small ostriches which, at about 20 days old, begin to get sick and pine away until they die? As there are evidently several causes involved in these cases it would be as well if ostrich farmers would take careful notes of symptoms of disease

among ostrich chicks, and communicate their observations to the Chief Veterinary Surgeon. Perhaps some of our more experienced correspondents can offer some information on the above cases.

Vegetable Matter in Wool.

The trouble continually caused to the trade by the presence of vegetable matter in wool is once more being ventilated, and an influential committee has been formed in London with the object of attempting to obviate the evils. This committee has issued a circular advocating first and foremost, the general adoption of a wool-pack of such a character that it will not depreciate the value of the wool it contains. The committee are pursuing inquiries in regard to the provision of a better bag. They hope shortly to be able to give further information, and to recommend an improved wool-pack and sewing twine for general use. The adoption of such a standard pack, made of good, clean, hard twisted jute or hemp yarn, carefully sewn so that the pack does not need to be "cut down" at the corners in the baling press, and provided with a separate piece of canvas for the top of the bale, would do a vast deal to mitigate the evil. The systematic emptying of the pack before it is put into the press. It is found that frequently bits of canvas and ends of sewing twine come inside the new packs from the factory. Care should be taken to see that these are shaken out In the shearing shed, in the classing and packing of wool, the utmost care should be used to prevent loose bits of twine, rope, or bagging coming near the wool, or being swept up with wool from the floor. The tying of the fleeces ought to be avoided entirely. All straw, etc., should be carefully removed from the shearing place before shearing commences. In stores and warehouses where bales are exposed for sampling, the necessary opening of the tare should be done so as to damage it as little as possible. Bales should be opened at the seams by cutting the sewing twine; and all frayed edges and loose bits should be removed and destroyed. It is recommended that printed cards should be provided for hanging in shearing sheds and warehouses in the following terms:—

For Shearing Sheds.

1. All straw, etc., should be carefully removed from the shearing shed before actual shearing is begun.
2. Turn out each bag before packing the wool, and see that it is clean and free from bits of hemp.
3. Loose bits of twine, bagging, or straw should be carefully kept apart from the wool.

For Warehouses.

1. All bales must be opened at the seams only, by cutting the twine.
2. Any frayed edges or loose pieces of string should be removed carefully and at once by men whose special care it is to watch the wools when "on show"
3. Warehouse "pullings" should be carefully looked over before being restored to the bales.

The Geology of Cape Colony.

We have been favoured with a copy of the second edition of "An Introduction to the Geology of Cape Colony." An interesting and highly instructive addition of Messrs. Longmans, Green and Co.'s South African

members of the Geological Survey, Messrs. A. W. Rogers, D.Sc., F.G.S., and A. L. du Toit, B.A., F.G.S., while the chapter on the fossil reptiles of the Karoo Formation, Prof. Broom, M.D., B.Sc., C.M.Z.S., of Victoria College, Stellenbosch, is responsible. This second edition includes the information gained since the first was published—and consequently is a considerable advance. It has also been carefully revised and largely re-written. The additions deal with the ancient rocks of the North of the Colony, the Karoo system, and the rocks of the volcanic pipes related to the Kimberley group. The geological map has been re-drawn on a larger scale, and several new and interesting illustrations are added. Though primarily intended for the student, the general reader, with a turn for science, will find plenty to interest him in this work, which is both useful and informative.

Poultry Fatalities.—A Warning to Beginners.

A correspondent sends the following as a warning to beginners in poultry farming: A short time ago, he writes, I hired a small place in the district of Stellenbosch, and took with me some good healthy fowls, which had been reared and spent most of their lives in wire netting pens. They were allowed to run on the farm, and seemed to feed principally on a succulent plant known in many parts of South Africa as "Gous Bloem," an excellent fodder for ostriches and stock of all kinds. For a few weeks they did very well, but one morning I noticed some of the birds sitting about in a dazed manner. Every ten minutes or so fearful spasms seized them, the heads and necks were thrown back and the eyes dilated. Fourteen were ill and one by one they died. Not one recovered! I had the bodies burned for fear the dogs might get at them, and sent one carcase to a veterinary surgeon. He said it was perfectly healthy, and from my description, the symptoms before death pointed to poisoning with strychnine, but he could find no traces of this or any other poison. A new boy had fed the fowls that morning, and I had seen him prepare the usual "Bran-mash." Being called away I threw in the salt, and told him to stir and put into the feeding tins. On inquiry I found he had *not* mixed the food after the salt was put in. The idea struck me that the first tin had got all the salt, and possibly it was the lot that had eaten from that tin that had suffered. So I tried an experiment, bought a hungry hen and gave it a good feed of bran and salt, mixed with hot water. In a few hours the poor thing was in convulsions, and I had it put out of its misery. I have always given a certain amount of salt to fowls in their soft food. The overdose was, of course, an accident, but leaving that out of the question I still think that for poultry kept in pens with very little green food it is beneficial, but when they are allowed free run they get all the salt their systems require from the growing plants, and to give it in their food is not only unnecessary but does harm.

Rail Rates on Grapes to Rhodesia.

The Department of Agriculture is officially advised that the reduction granted last year by the Rhodesian Railways on the railage rates in respect of grapes consigned, in lots of 500 lbs. and over, to Bulawayo and places North and East thereof, viz., from 2d. per ton per mile to 1d. per ton per mile, will again be allowed during the coming season. The same concession has also been made in regard to all other South African fruit, with the exception of Citrus fruits, for the period from the 1st October, 1909, to the 31st May, 1910.

A Merino Ewe with a Grand Record.

Noticing the photo of Mr. De la Grange's stud ewe in the September issue, Mr. R. Newton King (of King and Sons, Tarkastad) has forwarded a photograph of one of their stud ewes with a really fine record. "Topsy," as she is called, is now in her fourteenth year, and has borne no less than 25 lambs. Ten years in succession she had twins, then triplets (one being born dead and one still alive). After this she gave birth to a single, skipped one season, and has now the lamb shown in the photo here reproduced, which is now four months old. She has always reared her lambs by having free run in a lucerne paddock. As a two-tooth she took first and champion at the leading shows, cutting 20 lbs. of grand robust wool.

She was shorn on the 13th ult., the fleece returned 10 lbs. of clean wool, 11 months' growth After being shorn she weighed 105 lbs., and is in the pink of condition. She was bred by Messrs. King and Sons, at Wheatlands, her dam being an imported Vermont and her sire a Tasmanian bred by the late Thomas Gibson, of Eskvale, Tasmania, both sire and dam being owned by the Messrs. King.

The Mohair Market.

The following extract is taken from the "Financier," by Messrs. J. Daverin & Co., of Port Elizabeth, and circulated in their last produce report:—October has seen a large increase, both in enquiry and in demand for Mohair, and some good quantities have been bought in Constantinople as well as Port Elizabeth. Perhaps the most encouraging feature is renewed activity in the Cape article, this being a distinctly brighter phase

than we have seen for months back. It will be remembered that Cape Firsts have been neglected since last June, but all the while the consumption has been telling its tale, and spinners, convinced of the soundness of prices, have seen fit to buy liberally. There is no doubt that it has taken a long time for users to absorb the very cheap and heavy purchases that were made last year, but there seems an end to all these, and users at last are paying more attention to last season's clip. Cape Firsts at 14d. to 14½d. are very different to 10d. and 11d., and it is bound to take some time for consumers to get into a mind for paying higher rates. Cape Firsts cannot but meet with an increasing consumption, though users naturally do not like the upward trend of values. Prices are still reasonable, and if they keep so, trade is bound to develop The latest news is that 13d. has been paid in Port Elizabeth for Firsts, which means practically 14½d. landed in Bradford. Cape Winter had also been largely bought, although the largest users in Bradford have not as yet been buyers.

The World's Wool Trade.

Speaking of the current season's wool prospects, the London correspondent of Messrs. Daverin and Co, Port Elizabeth, states:—"The reported record clip from Australia will show but a moderate increase over last year's, whilst less wool will come from Argentine than during the previous season. In the United States the situation is distinctly good, many new mills having been erected and old ones enlarged, necessitating large requirements of wool from abroad, since the Home production seems to have reached high-water mark at present"

Death of Professor P. MacOwan.

We deeply regret to record the death of Prof. MacOwan, who for a number of years was intimately associated with the Agricultural Department of the Colony. He passed away at the ripe age of 79, on the 30th ult., at the residence of his daughter, Mrs. Chase, Uitenhage. Professor Peter MacOwan, B.A. (Lond.), F.L.S., was born in 1830, at Hull, in Yorkshire. He was Professor of Chemistry at Huddersfield College in 1859-62, and in the latter year was appointed principal of the Shaw College, Graham's Town From 1869 to 1881 he was Professor of Chemistry at the Gill College, Somerset East, and in 1881 was appointed Director of the Cape Town Botanic Gardens and Professor of Botany at the South African College. From 1892 until his retirement in 1905, Professor MacOwan held the position of Government Botanist. He was a member of the University Council from 1876 to 1891. In 1885 he was elected a Fellow of the Linnaen Society, and in 1890 of the Deutsche Botanische Gesellschaft. In 1902 the Cape University conferred upon him the degree of Doctor of Science, in consideration of his continued research work. He retired from the post of Government Botanist in 1905.

Readers of the *Agricultural Journal* will remember him mostly by his writings. The initials "P.M.O." were very familiar in the past years, and many a farmer in South Africa has to thank Prof. MacOwan for his

clear cut and incisive advice and information. Being widely-read and deeply versed in many subjects he wielded a facile pen, and though a little caustic at times, his satire was generally rounded off by a keen sense of humour. As a scientist he ranked very high in his day, and more than once evoked the unstinted praise of his fellow workers. He was also an accomplished classic, and had he not devoted so much of his time to investigation and research, might easily have left his mark on the literature of his time

Water Lifting Plant at Elsenburg.

The water trouble at the Agricultural College at Elsenberg has now been settled by the erection (by Messrs. G. Findlay & Co., the successful tenderers) of a 16 ft. Mogul windmill on a 40 ft. tower. It is fitted with a combination working head for wind and power, with fast and loose pulleys, 12, 16 and 20 inch adjustable stroke, and between 2,000 and 3,000 ft. of galvanised delivery pipes (2½ inch), working against a head of 150 ft.

SHOW DATES, 1910.

The following list of show dates for 1910 is supplied by the secretary to the Agricultural Union (Mr. A. A. Persse, Parker's Buildings, Capetown):—

Paarl : End of January.
Stellenbosch : February 3.
Robertson : February 9.
Caledon : February 11.
Ceres : February 15.
Queenstown : February 15 and 16.
Malmesbury : February 17.
Beaufort West : February 17 or 18.
Rosebank : February 22, 23, 24, and 25.
Molteno : February 23 and 24.
Aliwal North : March 1 and 2.
Graaff-Reinet : March 1 and 2.
Middelburg : March 3 and 4.
Dordrecht : March 4 and 5.
Grahamstown : March 10 and 11.
Port Elizabeth : March, 15, 16, 17 and 18.
Humansdorp : March 23 and 24.

Cradock, East London and Cathcart Societies are endeavouring to arrange their fixtures so as not to clash.

CHILLED SHOT AS A MEDIUM FOR ARTESIAN WELL SINKING.

By C. A. Scanlen, late of the P.W D. Water-boring Branch.

Experiments in this particular line of boring have up to the present date proved not altogether satisfactory. The difficulties attending this medium are numerous, more numerous, in fact, than those in the way of diamond or percussion drilling. The former is, however, so expensive that it is found advisable to find a cheaper, though less convenient method.

The Star Jumper is considered one of the cheaper processes; it is even cheaper than the chilled shot process now in use. Chilled shot drilling cannot be condemned as unserviceable, for the methods employed up to recent times have been rather crude, so that this process has not been shown to its best advantage: in fact, it is as it were in its infancy. Better ideas will, no doubt, in the near future present themselves to those who take an interest in the subject. This, like most inventions, needs improving upon until it is brought to perfection, when the full benefits may be derived from it. Doubtless when completed it will prove to be a useful and economical medium. Like the diamond drill, this one also requires a continual circulation of water passing through the force-pump and lining tube, so as to ensure the cutting instrument of having a clear surface to work upon, and to keep away rock sediment and shot residue made during the operations. In addition to this, it must be so manipulated as to keep the small pellets of shot well under the bit. Besides these agents a special water-connection is required. The new pattern is preferable. This is an apparatus provided with a tee piece, so fixed and constructed as to be united to the hose-pipe from the force-pump and boring rods. It is so manufactured as to leave an aperture at the top, through which the shot is poured in small quantities at intervals. The rods being hollow, the shot when poured in fall down as far as the point of shot bit, where they remain; for this reason the rods and bit have to be lifted a few inches, so as to allow the shot to get under the facing of bit, which is done by the assistance of water from the force-pump. To perform this feat all the machinery has to be stopped, and when accomplished to satisfaction the rods, etc., are again lowered, and work recommences. When the shot is exhausted the same ordeal is repeated.

It is necessary to exercise great care in using the force-pump, for if it is used too forcibly the shot will be washed from under the bit before it has completed its intended task; the cylinder plunger may also be strained.

Another difficulty attending this medium is that the component parts of the drilling plants are so crude and fragile that it necessitates a foreman to be constantly on the *qui vive* so as to avert damages which occur in the course of operations, and cause considerable delay in the repairing. In connection with all these necessary acquisitions in shot drilling, a stouter core-barrel made of the best steel is required; it must be well tempered, so that the shot is ground away before the bit's facing, which has a tendency

to become levelled. It is required to be almost twice as stout as those employed in diamond drilling, with a flat, even surface, so as to enable the shot to be kept well under control, affording it an opportunity of penetrating the strata before it is exhausted.

Chilled shot is considered the best medium for the penetration of extremely highly indurated strata, owing to its cutting capacity, but as yet the correct method of employing it has not been ascertained.

There is still another obstacle to be conquered, which is, that the core becomes terribly tapered; in order to overcome this obstacle a special tool has been manufactured, which is commonly described as a core-catcher; this instrument is constructed similar to those used on the diamond drills, but on a larger scale.

For extracting core from a borehole this implement is screwed on to the core-barrel, after the bit has been disconnected; it is then lowered over the core in hole. It is made so as to act as a spring, which enables it to grip the core firmly, but with the tapered core it has very little chance of gripping. Before it arrives at the surface the core falls back into the hole, even if work is carefully executed. In addition, the core prevents the pellets of shot in passing between it and walls of borehole

There is still one more hindrance, which is that the small pellets and pieces of broken shot destroy the threads and joints of boring rods at a frightful rate. It is found advisable not to continue a hole with diamonds in which shot has been used, even if shot has been found impracticable.

The reason for this is that small bits of broken shot, which have become embedded in the walls of the borehole, will gradually work loose and fall into the hole, and utterly destroy a diamond crown in a few minutes.

The type of bit and core-barrel used until recently has not achieved any great success; this is due to the fact that it tapers the core to such an extent as to cause the difficulty of extracting the core, which cannot as yet be coped with.

It would be of considerable assistance to drillers if some of our more enlightened engineers would suggest a bit slightly fluted on the inside, thereby allowing a free passage of shot between bit and core; this would ensure less tapering of the core. No doubt, chilled shot chokes all small water-bearing fissures, but in the case of larger fissures the shot is washed away by water, and is therefore unable to perform the required work.

With shot drilling the weight has to be so manipulated as to force the small pellets of shot into the rock, and keep them well under the bit while the drill is revolving; this ensures satisfactory work. More weight is required for chilled shot drilling than for diamond drilling; this is owing to the fact that the diamonds have a rough cutting edge, which grinds the rock away during the revolutions on the drill.

There is no doubt that the "Chilled Shot" process will, if properly studied and utilised, prove an excellent medium for mineral prospecting work.

THE SALE OF FERTILISERS AND FARM FOODS.

By Dr. C. F. Juritz, Senior Government Analyst.

Just over a year ago the writer published in this "Journal" a few notes on the registration and purchase of fertilisers. A series of regulations under Act No 20 of 1907, "The Fertilisers, Farm Foods, Seeds, and Pest Remedies Act" had then been newly promulgated: both for the sake of the farmer and purchaser, as well as in the interest of the importer and vendor, it was desirable to explain, in as simple language as possible, some of the technical requirements of the Act, and of the regulations framed under its provisions.

A year's experience has shown the need of amplifying these regulations in some respect and of modifying their scope in others. Hence, after careful revision, a fresh set of regulations, superseding those of last year was promulgated in the "Government Gazette" of Tuesday, the 9th November.

To a large extent these regulations cover the same ground as those that preceded them, and it is unnecessary to explain again points which were fully dealt with in the issue of this "Journal" for November, 1908. There are nevertheless new features to be considered, and as these will control the sale of all fertilisers, and farm foods, during the fast approaching season it is considered desirable to make clear any doubtful or obscure points arising out of the recently promulgated regulations.

Attention may be drawn to the necessity of registering afresh all fertilisers, farm foods, etc., for the coming year. The registration certificates of the 1908 season cease to be valid with the expiration of the calendar year, and each brand needs to be specifically registered anew before any of the articles to which it pertains can be sold after the new year begins.

In connection with the matter of registration it will also be observed that a new principle is introduced in No. 4 of the regulations now issued. Formerly it was the practice to register such a name as "31 per cent. Superphosphate." The objection to this is twofold: it is, as remarked in my previous article, and as will be emphasised again in a subsequent paragraph, undesirable that in two fertilisers containing one particular plant food constituent in identical proportions two widely different figures should be used to denote those proportions. As shown in my previous article it has been not unusual to receive for analysis one sample branded "Superphosphate 30 per cent." containing about 16 per cent. of total phosphoric oxide, while another, containing the same amount, is marked "Superphosphate 14 to 16 per cent." This loose practice cannot but be confusing to the farmer, who does not realise that the one merchant is speaking of the *phosphoric oxide* in his fertiliser, and the other of the *tricalcium phosphate.*

Even if the above objection were less cogent than it is, another phase of it may be illustrated from the experience of the last twelve months. An article is registered, let us say, under the name of 45 per cent. sulphate of potash. On analysis it is found to contain potash to the extent of only 40 per cent The farmer, misled by the figures in what may be called

the official name, takes it as being of higher grade than it is. In such a case "45 per cent." is supposed to be part of the name or brand of the article and not to indicate its actual composition. Until the new regulations were promulgated as little objection could have been taken to such a misleading practice as to that in the superphosphate alluded to just before. How far the guileless may be led astray by the ingenious intermixture of names and figures may be shown by another case. A basic slag is described as "80 per cent. citrate-soluble." This would seem to denote that the slag contains 80 per cent. of citrate-soluble phosphoric oxide. Any chemist would see the absurdity of this at once: not so the agriculturist, accustomed to less than 20 per cent. in the articles he usually purchases; hence he buys this one with alacrity. Analysis subsequently shows the slag to contain only 13 per cent. of citrate-soluble phosphoric oxide and it turns out that the description should have been taken to convey the meaning that 80 per cent. of the phosphoric oxide in the slag is citrate-soluble: in other words, that, as the slag contained about 17 per cent. of phosphoric oxide in all, 13 per cent. would represent about 80 per cent. of that amount. This, I may add, is founded on an actual occurrence.

To avoid any such confusion in the future all use of numbers in brands is prohibited, and so regulation 4 provides that no name or brand will be registered if numbers representing the proportions of any active constituent are stated therein.

The above remarks apply only to the registered name or brand of a fertiliser, not to anything that may be printed on any advertisement or label. There, of course, the use of figures representing the proportions of fertilising constituents cannot be reasonably objected to; but the regulation provides that in all such cases the fertilising constituent be referred to in explicit terms, and according to a uniform system of nomenclature, explained in more detail in a subsequent paragraph. Under this regulation the name of the constituent actually designated must always precede or follow the percentage number, and this name must, moreover, be one which is officially recognised.

Labels on receptacles containing superphosphates must clearly convey the exact quality of the contents of each receptacle. Five grades of superphosphate are recognised, namely:—

High grade, containing *over* 17 per cent. of water soluble phosphoric oxide.

Medium high grade, containing from 15 per cent. to 17 per cent.

Medium grade, containing from 13 per cent. to 15 per cent.

Low grade, containing from 12 per cent. to 13 per cent.

Under strength, containing less than 12 per cent.

In each case the bag or other receptacle must be distinctly marked either "High grade," "Medium high grade," "Medium grade," "Low grade," or "Under strength." Furthermore, each such receptacle is to be marked with the minimum percentage of phosphoric oxide which its contents are guaranteed to contain: thus, it will not be sufficient to mark a medium grade superphosphate which contains, let us say, 13·2 per cent. of water soluble phosphoric oxide simply "Superphosphate, medium grade" and leave the purchaser to infer that it may perhaps contain close on 15 per cent. of water-soluble phosphoric oxide. It will be essential in all such cases to mark the figure 13·2 per cent. equally distinctly on the containing receptacle.

Another point connected with the labelling or advertising of fertilisers is involved in the use or misuse of the word "guano." It is now provided that this word is not to be used except under certain rigidly limited conditions It may be used only in connection with sea-bird guano, bat guano, fish guano, and whale guano and also in connection with

guano phosphate. In no case may the word "guano" be used standing alone, except when it denotes sea-bird guano, and then only when the nitrogenous constituents are still present. The other three classes of guano above mentioned should not be described simply as "guano" but must in every case be preceded by the appropriate descriptive term—*i.e.* either "bat" or "fish" or "whale." If the nitrogenous constituents have disappeared from guano it may no longer be described as such—the practice has hither to been to describe such an article as "phosphatic guano": this term must henceforth be replaced by "guano phosphate."

In my former article, above-mentioned (see "Agricultural Journal" of November, 1908) I referred to the absolute need of uniformity, not alone in the way of stating percentages, but also in the terms used when speaking of some of the plant food constituents in a fertiliser. It is often undesirable. where a loose habit of nomenclature has been long indulged in, to attempt a sudden transition to right lines: hence all sellers of fertilisers were, under last year's regulations, made to state not only the amount of *phosphoric oxide* in their manures, but also the figure representing that amount if calculated as *tricalcium phosphate*. This was a concession to those who had been in the habit of stating their figures in the latter and not in the former way. At the same time I pointed out from the first that the proper expression to use is *phosphoric oxide*, "as that expression clearly and without ambiguity denotes the fundamental constituent of all phosphatic manures."

Now that we have got as far as a successful introduction and consistent employment of the correct term we may well drop the use of the frequently misleading and often wholly incorrect and unscientific expression. Hence those who compare the recently promulgated regulations with the regulations of September, 1908, will perceive that "the equivalent of the phosphoric oxide expressed as "tricalcium phosphate" will now no longer appear on the registration form. It will henceforth be sufficient to state the percentages simply as phosphoric oxide, and dealers are advised to bring this to the notice of their correspondents across the water and of their consulting chemists, so that a consistent method of stating these results may be adopted by all.

Reference was made, in my article already referred to, to the importance of fertilisers being in a sufficiently finely divided mechanical condition. In the regulations then issued no provision on any such point had been made, but I recommended that bone-dust or bone-meal should be of sufficient fineness to ensure 80 per cent. thereof passing through a sieve of eight meshes to the linear inch, and it was pointed out that non-compliance with this condition was an offence under the Fertilisers law of Western Australia. The regulations recently put in operation in the Cape Colony make this condition compulsory here as well. Another point recommended in the last year's article was that basic slag should be sufficiently fine to permit of at least 75 per cent. thereof passing through a sieve of 100 meshes to the linear inch. This recommendation too has been adopted and any article sold in this Colony under the names of Basic Slag, Thomas' Phosphate, or Thomas' Slag, must now conform to it.

On the subject of invoice certificates little need be added to what was said last year. The invoice form for fertilisers has been slightly amplified, making provision for stating water-soluble and citrate-soluble phosphoric oxide as well as the total proportion of that constituent. The form of invoice to be used in the case of farm foods is likewise illustrated: the latter will be the subject of more specific remarks in the following paragraphs.

Both in the registration and in the invoice forms provided by the regulations the constituents of farm food are classified under the four heads of proteins, fat, carbohydrates, and fibre. In the briefest possible words

the significance of these terms may be described. Food has two chief uses: (1) it builds up the body and repairs any waste that occurs from time to time, and (2) it supplies the body with heat and power; in other words, it acts as a fuel. The first of these two uses it falls principally to the proteins to provide: they build up the muscles, the tendons, the skin. But they do more than this; they provide the body with energy. The fats and carbohydrates cannot build up the body as the proteins do; they can only, by their combustion in the body, supply the warmth and power it needs. The proteins also undergo combustion. supplying heat, and where an insufficiency of carbohydrates and fats is given to an animal the proteins are used up in this way. A good supply of fats and carbohydrates accordingly saves the proteins from being used up too rapidly.

It will be seen from the above that all three, proteins, fats, and carbohydrates, are of value to the body, to keep up its warmth; that is to say, they are of value as fuel. But they are not of *equal* value in this respect. As the proteins are the chief builders-up of the body, so the fats and carbohydrates are the chief fuel ingredients in the food, the fats on account of their concentration, the carbohydrates, as a rule, on account of their quantity. The value of the different constituents of food is measured as "calories." The exhaustive practical experiments of the Experiment Station Office of the United States Department of Agriculture have led to the conclusion that one pound of proteins may be valued at 1,820 calories, and that the same value may be assigned to one pound of carbohydrates, but that fat, being a more concentrated form of fuel, is equal to 4,040 calories per pound.

Each class of articles of the three above-named has therefore its own distinctive feeding value, and so it is important that, in judging of the suitability of a farm food, the proportion of each article should be distinctly stated. All this, however, is on the supposition that they are capable of being properly digested by the animal feeding upon them. Now it so happens that some carbohydrates are considerably less digestible than others: these indigestible carbohydrates are mostly composed of what we call cellulose, the substance which goes to make up the woody fibre in plants. Thus when it is stated that a plant food contains a certain percentage of carbohydrates, we naturally go on to ask: What proportion of the carbohydrates is indigestible? in other words: how much of it is woody fibre? Whatever proportion that is, it should be deducted from the total percentage of carbohydrates in a food if we wish to arrive at a true idea of the food's nutritive value. A cake of sawdust may yield a large proportion of carbohydrates, but, as most of this is simply fibre, its food value is next to nothing. If a registration certificate or an invoice gave simply the percentage of carbohydrates in such a "food," and did not state what proportion thereof was fibre, the purchaser would be egregiously misled.

In the foregoing remarks an endeavour is made to elucidate the principal features of the additional regulations which have just come into operation. Any matters of detail which, to either farmer or dealer, may yet appear in any way uncertain or obscure will be gladly explained on application at the offices of the Department.

SOIL SURVEYS.

The following is the concluding part of the Presidential Address delivered by Dr. C. F. Juritz to Section II. of the S.A. Association for the Advancement of Science at its meeting at Bloemfontein on the 29th September:—

From these cursory glances at some of the almost routine matters that have called forth what little chemical investigation has hitherto been carried on in this country, I turn to place before you, in conclusion, just one of the many functions which the science must fulfil in the Union we are now entering upon. I purposely brought to your notice the transitional state of science in my opening remarks, because it is a condition wherewith we as a people can sympathise keenly to-day. Under the circumstances you will, I am sure, agree that the relation of chemistry to agriculture should be in the very forefront of our thoughts. It is altogether too large a theme to deal with adequately, but let me pass on a thought or two concerning just one aspect thereof.

One of my first recommendations to the Government of the Cape Colony, when I first took charge of the laboratory there, was that an agricultural chemical soil survey should be started forthwith. The results up to date have, I confess, come far short of my anticipations, but good fruit will have been borne if that incipient work does no more than form a nucleus from which may radiate to every part of the Union a wider, fuller, and in every way better network of investigations. As I placed my proposals before the Cape Government in 1892, so it is my privilege to-day to put the importance of these wider investigations before this greater constituency. It is not alone of the chemical analysis of the soil that I now speak; the subject of soil investigation extends into a considerably ampler field, and embraces such matters as soil physics and soil bacteriology. I would not even place the actual chemical analysis of the soil absolutely first in order of time, for, if only the facilities be given, it should be accompanied, if not preceded, by a study of the soils of each locality on the basis of their physical resemblances, coupled with the natural distribution of their indigenous flora.

We have not been able to do all this in the Cape Colony, because the entire work of investigating the Colony's soils has always been allocated to one solitary man, and even then it has been subject to constant interruption. The United States Department of Agriculture, fifteen years ago, devoted an entire Bureau to the exclusive work of studying the soil. Besides the Chief of the Bureau and his chief clerk, its scientific staff comprises six sections, each in charge of a professional officer: one of these superintends the physical and chemical investigations of the soil, another the fertility investigations, and a third the work in connection with soil erosion; then one is occupied with the subject of soil utilisation, another with soil

management, and last of all there is one in charge of the soil survey. These have each their respective quota of assistants, while, in addition, the work of the soil survey maintained twenty parties of two men each in the field during 1904. Ten years after its establishment, the staff, originally numbering ten, had increased to 127, including 83 scientists and soil experts, 13 tobacco experts, and 29 clerks and other employés, and then the staff was found inadequate for one-half the demands made upon it for investigations along its special lines.*

Someone asks: "What is the use of a soil survey?" The reply is best given from the words of Professor Milton Whitney, Chief of the United States Bureau of Soils:—

"From its surveys" (he says) "the Bureau is steadily accumulating a great mass of information about the various soils found in different parts of the country. This will soon enable it to state accurately what soils are best adapted to the production of different kinds of cotton, tobacco, corn, wheat, and other staple crops. In many localities crops are being grown on soils which are not adapted to them. Thus in many States attempts are being made to grow wheat on soils so sandy that only a very low yield can be obtained. . . . In the mountain fruit districts of our Southern States certain soils are not only adapted to certain fruits, as apples, peaches, grapes, etc., but distinct soils are recognised as best adapted to single varieties of these fruits.

"An example is the mountain soil . . . . which in Virginia is called 'Pippin land,' because the celebrated Albemarle Pippin does better on it than on any other soil. With the present system of classification and knowledge of these mountain soils and their adaptation to different varieties of fruits, the Bureau's soil survey parties can enter any of the mountain areas of our Eastern States and quickly and accurately distinguish the good fruit lands from the poor. . . .

"The investigation of important agricultural industries which have been developed on soils with certain characteristics, enables the Bureau of Soils to recommend safely the introduction of such industries in other localities where similar soils and climatic conditions prevail. An example of this is the mountain peach industry of Western Maryland. It was found that peaches of superior quality and flavour could be grown on some of the stony foothill soils of that section which were worthless for general farming purposes. The peaches grown here ripen in season to be placed on the market at a time when the supply from other localities is small and prices correspondingly high. Upon extending the soil survey into other parts of Maryland and into the adjoining State of Virginia the Bureau of Soils was able to recommend the introduction of the mountain peach industry in a number of places where conditions of soil and climate similar to those of Western Maryland were found. . . .

"The soil survey is of considerable value also in furnishing instruction as to the cultivation of different kinds of soils in various parts of the country. That sandy soils and heavy clay soils require widely different methods of cultivation has long been known, but the great importance of this has been most clearly brought out by the comparative methods of the soil survey. . . .

"As an illustration of the monetary value of the Bureau's work in establishing the relation between soils and crops, it may be stated that the soils of the Connecticut valley, which the Bureau declared were adapted to the growing of a superior wrapper tobacco, increased in value more than three fold. . . Other instances of the increase of land values through the discovery of the adaptation of certain soils to special crops may be cited. The trucking soils of the Atlantic seaboard have increased of late years from a nominal value of five dollars an acre to 200 dollars or more an acre. The rice lands of Louisiana have increased in value from five dollars to fifty dollars an acre. The Florida soils, adapted to the growing of pineapples, have risen in value from practically nothing to over 500 dollars an acre.

"Yet another advantage of the work of the soil survey is the accurate basis which it furnishes for further experimentation. The mapping of the different soils in the several States serves as a true guide for further experimental work, whether with methods of cultivation, or of crop rotation, or with different manures and fertilisers. . . .

*U.S. Dept. of Agric. Bureau of Soils Circ., No. 13, revised, p. 1.

"In several instances the Bureau of Soils has rendered valuable service to would-be settlers in undeveloped sections of the country. The incorporation of companies to open up and to advertise large tracts of land sometimes leads to exploitation of regions unsuited to agriculture. The agents of the Bureau have been called on from time to time to investigate these lands, and in some cases have discovered that they were of little or no value to intended settlers, either because of the presence of alkali or because they were not adapted to the only crop suited to the area . . . . and the publication of these facts has saved many home-seekers from investing their all in ventures which were bound to prove unprofitable."*

I remarked, at an earlier stage, on the selfishness that shines through the objections to scientific investigation because of its benefits becoming visible only in the third or fourth generation; here we have recorded an almost incredible array of the most fruitful results of a series of investigations begun as recently as ten years before that record was penned.

It may be asked how one should set about work of this class. Well, several phases of the survey may be carried on concurrently, but if any portion should precede the rest it should, I think, be the collection of data respecting both the distribution of the country's indigenous flora and the success, or otherwise, of cultivated crops where such culture is practised. The bushes and herbs which grow wild on certain soils constitute so many natural indications regarding the condition of the soil, and hence of its suitability for this or that form of culture Thus the natural vegetation of a soil may denote a high degree of brackness or alkalinity, and that tells us at once that in its present state that soil cannot bear—let us say—a crop of wheat. If in another locality that same natural vegetation is found to be dwarfed and stunted, we may draw the conclusion that there the alkaline salts, although present, are less abundant than in the former case, and that, consequently, at least *some* farm crops may be got to grow there. Then, again, there are bushes of the type of the rhenoster bush, as it is called, which is supposed to indicate a soil deficient in lime, and accordingly unsuited for fruit culture. Other indigenous herbs there are which characterise a soil capable of yielding good returns under cultivation. Our task is, therefore, to find out the meaning of the language wherewith the indigenous herbage indicates to us the characters of the different soils. For the most part this language is written in hieroglyphics which it is our first and foremost function to decipher. Now this important study may be neglected, but, like the Sibylline books, the longer we delay the more dearly shall we purchase wisdom in the end, and it will become practically impossible to carry out the study at all when once cultivated fields replace all the indigenous vegetation. The opportunity still exists; the virgin lands of the South African Union are to a large extent yet in possession of their natural flora, and no one has been more earnest than Professor E. W. Hilgard in pleading that in his country at least steps should be taken to ascertain this information ere the possibility of procuring it passes out of reach for ever. Dr. Hilgard emphasises the desirability, not only of collecting such information, but also of mapping the data thus procured as speedily as possible. He says:—†

"Since the object of soil-surveys is essentially practical—is to enable us either to generalise from the experience had on other lands, or to predict the agricultural qualities of new lands—the *prima facie* evidence of the *natural vegetation*, which results from the secular co-adaptation of soils and plants under given climatic conditions, is manifestly of first importance. It is almost self-evident that whenever we shall learn to interpret correctly and accurately the meaning, from the farmer's standpoint, of the indications given by the local floras and sylvas, we shall be able

*U.S. Dept. of Agr. Bureau of Soils, Circ. No. 13, revised, dated April 8, 1905.

†"Soil studies and soil maps"; in the "Overland Monthly" for Decr., 1891.

to deduce from them, measurably, the same results we now gather from long agricultural experience, or from culture tests with fertilisers. It is also evident that in countries long settled and under cultivation, these important factors become obscured and more or less unavailable, by the modification or disappearance of the original vegetation under the disturbing influence of human agencies. It is, then, doubly important that the original state of things should be put on record as quickly as possible; and this I consider to be, in all cases, the first step to be taken in constructing the soil map of a State. Such a judiciously constructed botanical map is, in many cases, quite sufficient to indicate summarily the agricultural capabilities of extensive regions."

Failing the natural vegetation of which Dr. Hilgard speaks, we have, as I said before, the success or non-success of cultivated crops and orchards to guide us, and the information to be sought with regard to these last is so very obvious that I do not wish to insult your intelligence by dwelling on it.

But the soil survey should not stop short with a botanical map, important though the information may be that it affords. Let us have our botanical map, but let it be supplemented, with the least possible delay, by a physical soil map, noting all along the line the correlation between the two; and either concurrently, or soon after, should come the chemical investigation of the soil. The physics and chemistry of the soil, and more especially the latter, should in their turn be correlated with the geological survey of the country, which, if it has preceded the agricultural soil survey, will be found of immense value and assistance to the latter.

As the distribution of the vegetation has been noted, so the distribution of the corresponding soil types is likewise to be observed. During the fifteen years that the Soil Bureau of the United States Government has been at work, detailed soil maps, on the scale of a mile to the inch, have been published for a total area of 150,000 square miles. These maps show how the different soil types are distributed over this wide area. The Bureau has given so good a lead in the matter of soil classification on a physical basis that I feel constrained briefly to summarise its methods. The practice is to classify soils in types, series and provinces. Soils identical in origin, texture, structure and colour are taken to belong to one and the same type, and are given a type-name accordingly. By origin is meant geological origin; all soils derived from one particular geological series, or, where greater discrimination is possible, from one particular member of a geological series would be considered as identical in origin. By texture is meant the relative proportions of different sized mineral particles which a soil contains. To determine these requires the process of mechanical analysis, and soils are by its means divided into silts, loams, clays, sands, and so on. When speaking of texture the variation of texture between the surface and subsoil layers to a depth of, say, three feet is implied. A layer of sand may rest upon a subsoil of loam, and this would be different in type from that of a soil which is sandy throughout its whole depth. In soils of a common origin, therefore, it is difference of texture that ultimately determines the type. All soils that are one in origin, and alike in colour, but differ in texture, are grouped together into one soil series. What has been called the Norfolk series of soils extends over nearly ten million acres in the States of Florida, Georgia, Alabama and others adjacent. Within that series there are thirteen types of soil, the most extensive being the Norfolk fine sandy loam, which covers over three million acres. The geographical name Norfolk is here used as a series name, the term expressive of the texture indicating the precise type of soil.

Differences of colour are considered sufficient ground for placing in separate series soils which are identical in origin and texture, since

"this colour difference stands for a difference in the chemical changes which go on in the soil, and which are necessary for the welfare of certain crops."*

So, too, difference of structure is reason enough for constituting a fresh soil series, or for at least temporarily leaving unclassified soils exhibiting such peculiarities. Greater compactness, for instance, or a more pronounced open structure would give cause for such discrimination. Hence, while it is usual to assign to one series soils of the same origin and resembling each other in structure and colour, the texture of the soil indicates its position within that series.

As soils of various types are classified in series, so the series are grouped into provinces, dependent upon mutual resemblances amongst the series of soils so grouped, and resulting partly from geological origin and partly from the dominant agencies that operated in the formation of the soils. Time fails for explaining how the work of a soil survey party is carried out in the field, but anyone interested will find a brief account on pages 21-22 of my Annual Report for 1906 as Senior Government Analyst of the Cape Colony.

Working upon the principles just outlined, the United States Bureau of Soils has divided the Union into fourteen soil provinces: these are further divided into 86 soil series, and these again sub-divided into 715 soil types, each type covering on an average about 130,000 acres of the ground that had been surveyed up to the beginning of last year.

And if the American Union has regarded as so necessary this work of soil classification, must it not be as needful for the South African Union? Rather let me ask, is it not much *more* necessary in our case? For America may have at her disposal resources other than agriculture; with us it is—or should be—paramount as a staple industry. To us, too, should apply the words of the President of the Association of Official Agricultural Chemists of the United States when addressing that Association's 16th Annual Convention in 1899:—

"The soil is very literally the bottom fact of all agricultural processes, and it is to the soil we have given our chief attention; its chemical composition and physical properties, the quality and availability of the plant food in the soil."

Professor Hilgard, Director of the Agricultural Experiment Station of California, in his classic treatise on "Soils," published in 1906, says of soil investigation that

"it is not easy to imagine a subject of higher direct importance to the physical welfare of mankind, whose very existence depends on the yearly returns drawn by cultural labour from the soil."

If these views are correct—and it is my conviction that they are—has not the time arrived for this important subject to be tackled in right earnest in our own South Africa instead of continuing merely to be toyed with? Again I say, we cannot afford to ignore what the American people think it worth while to treat so seriously, and we may quite fitly apply to ourselves the closing words of an address delivered by Professor C. G. Hopkins to the American Society of Agronomy at New York fourteen months ago. He said:—

"Permanent agriculture is the only structure upon which the future prosperity of the American nation can be secured, and the absolutely essential foundation of permanent agriculture is the fertility of the soil."

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*M. Whitney: "Soils of the United States," U.S. Dept. of Agr. Bureau of Soils, Bull. 55, p. 23.

How applicable to ourselves! Especially in this birth-year of the new South African nation! Chemical science will have many important functions to perform on behalf of this young nation, but the need for understanding more fully the physics and chemistry of our South African soils must stand foremost. Therefore I have spoken to you on a subject whose urgency has even been prominent before me these many years past. Of course, I could not deal with the science of the soil in all its aspects; the chemistry of plant food in the soil has been the subject of my remarks on other occasions, and the great question of brack or alkali was dealt with by me at the first South African Irrigation Congress four months back. But fundamental to them all, in my opinion, is the subject of soil classification on what is primarily a physical basis as I have delineated it. When that has been properly attended to we shall be better able to give sound advice to practical agriculturists.

This, then should be the very first function that agronomic science should undertake to perform for the South African Union, and I trust that ere long we shall see, not one or two investigators at work in pursuance of this aim, but a whole band of workers right throughout the Union, and that, as they go on in their plodding, and at times perhaps monotonous labour of adding analysis to analysis, and piling fact on fact, they may ever bear in mind, and that the Government of the Union may likewise remember the words of Professor Hopkins, which I venture thus slightly to alter:—

"Permanent agriculture is the only structure upon which the future prosperity of the South African nation can be secured, and the absolutely essential foundation of permanent agriculture is the fertility of the soil."

JUDGING AND VALUATION OF OSTRICH FEATHERS, AND FEATHERS REQUIRED BY THE TRADE FOR SPECIAL PURPOSES.

By R. W. THORNTON, Government Agriculturist.

For some time past an unusual degree of interest has been displayed with regard to the ostrich feather industry in South Africa, and just lately over-production, more especially of common feathers, has been considered. It therefore seems a seasonable time to publish a full report on the subject compiled from such data as has been collected by this Department from time to time.

As will be seen from the above heading and what follows, this article deals with various questions in connection with feathers, and will be followed later by a fuller article on this question, which will also deal more extensively with the overproduction or non-overproduction of feathers, compiled from data now being collected all over the world, and the results will be given of feeding, crossing of different strains and other experiments.

In November, 1908, feeling the want of accurate knowledge in many parts of the country as to which class or classes of feathers are required for special purposes by the European and American manufacturers, it was deemed advisable to make a collection of the various *well defined* types of feathers existing in the Colony at present, and send these to the Trades Commissioner in London to be submitted to the best authorities for report, this was accordingly done. The collection was made on the following lines. Representative specimens of feathers from old and well established strains were selected. There were necessarily many intermediate classes which, though beautiful, were not required, as not being representative or typical of any particular strain. A few feathers of extreme types were also selected for the sake of comparison, by the use of which at lectures the good and bad points could be more clearly shown.

It may be as well to state that these feathers were collected without any consideration as to individual, district, or province distinction. The distinct types were required, and if not obtained from one man were obtained from another, and in only one or two cases was it found necessary to purchase feathers for some special reason, otherwise feathers were supplied free of charge by the farmers, to whom thanks are due for their hearty co-operation in the matter, and though districts were not considered, as it was individual and well marked types of feathers that were required, yet it is worthy of note that all the leading feather-producing districts were represented.

As far as possible the following feathers from each particular strain were selected and sent to the Trades Commissioner:—

2 Primes.	2 Blacks.	2 Tails.
2 Feminas.	2 Drabs.	2 Femina Tails.

Each individual feather was carefully labelled with a letter and a number. The letter represented the type and the numeral a distinguishing mark for each feather of the type. This was thought advisable for two reasons: First, to make it impossible for the men judging feathers to know their origin, though this was not considered of great importance; and the second, to prevent anyone outside this office from becoming acquainted with the owners' names, more particularly of those feathers which were valued highest at per pound according to the sample sent and received the highest number of points. This was done especially to avoid any protest being raised on the score that any man's feathers and birds were being advertised. The feathers were, as before stated, sent to the Trades Commissioner, who submitted them to each of the leading firms in turn, with a copy of the questions asked, and with a request that each feather be valued and reported on individually. The replies given to the questions were in most cases so similar, though received from different firms at different times and places, that these have for the most part been condensed, but when differences of opinion occurred special note has been made.

The valuation of the feathers, though seldom differing to any great extent, have been averaged throughout, and the points worked out are here illustrated, with samples of extreme types with their average values.

The questions asked of each firm and the replies received are as follows:-

(1) What kind of quill or midrib is the most desirable?—Thin light quill, because a stout quill is unsightly when manufactured, and means fewer feathers to the pound.

(2) Length?--Three-quarter to long, or 18 inches to 2 feet and upwards. The longest at present command the highest prices *if* the feather remains perfect throughout. But fashions may alter this, though long feathers are always worth as much at least as the shorter ones

(3) Tip, whether broad and full, or curly, etc.?—Tip, to be perfect, should be broad, full, *i.e.*, dense, droopy, and curly. The latter is not of any great importance, as this can be remedied by artificial curling.

(4) Density?—The richer, denser, and closer the flue the better, provided it is *not* woolly.

(5) Square butt, or squareness at foot?—The feathers should be as wide as possible at the foot. Narrow feet or narrow bottoms are considered most undesirable, in fact, this is one of the most important points.

(6) Evenness and length of flue?—It is most desirable that the flue on each side of the quill be of equal length and as long as possible, provided it is not ragged, that is one flue longer than its neighbour, or too soft, that is too droopy or weak, *i.e.*, not self-supporting.

(7) Uniformity of feather, that is if the feather should measure the same width at the base, centre, and say 4 inches from the tip?—Yes, the feather should be as uniform as possible throughout, running down wider, if anything, at the foot.

(8) Lustre?—Lustre is very desirable, and the brighter and glossier the feather the better. This is especially the case with dark feathers.

(9) Curl, that is, is natural curliness very desirable?—Natural curliness is desirable, but the trade does not pay very much extra for this, as feathers can be artificially curled.

(10) Colour, whether white, blue-white, or any other natural shade is most desirable?—As white as possible, but above all, the feather must be left in the natural state, for the reason that the American Customs demand 50 per cent. *ad valorem* on feathers improved or advanced in any way.

(11) Jet blackness of blacks?—Uniform jet black colour is best, that is entire absence of a russet or red or bronze tinge. The white in blacks, if hard, is no detriment, but if soft, then undesirable.

(12) Colour of drabs?—Dark bright drab is best, but lighter coloured not objectionable for certain purposes.

(13) and (14) Cock and hen tails, any special comments on possible points?—As large and dense of flue as possible. Femina tails seem to have improved in length, but not in quality. Cock tails as a general run appear not to have improved in quality or length.

(15) General strength of all classes of feathers, that is, should the flue be strong enough to stand out at right angles to the quill?—To demonstrate the concensus of opinion and the importance attached to this point, some of the replies are here given:—

(*a*) Of the utmost importance that the flue should be hard and strong, which will make a useful feather for dyeing.

(*b*) It is *most* desirable that all feathers should be strong, and that the flue, if possible, should stand out at right angles from the quill.

(*c*) Flue should, if possible, stand out at right angles to the quill.

The remaining replies are much in the same strain.

(16) Woolliness of all classes?—

(*a*) Woolliness undesirable.

(*b*) Woolliness objected to, soft and spongy feathers undesirable.

(*c*) Woolliness very objectionable, if anything more so in Blacks and Drabs.

The remaining replies are in much the same strain.

(17) Is the Byock tip any detriment in good white feathers?—The Byock tip is a decided detriment in first-class white feathers, and a considerable difference is often made in the price, due to this fault.

The following general statement is given to act as a guide.

Fashions are changeable, therefore it is impossible to make any definite statement as to which class of feather will hold the market to the best advantage in the future. This applies more particularly to the length of feather. The demand for long wing feathers, either white or femina, has been very constant. Medium whites are also largely used for making fans, etc. It is very desirable that feathers should be wide, and the flue strong and self-supporting, as these stand dyeing best. Quilly feathers with narrow feet are disliked, and bars are a serious detriment, especially in the retail trade, that is the sale of single feathers. Woolliness in all classes much disliked.

BUYING ORDERS.

The following notes on the buying orders issued by one of the largest manufacturers in New York to their representative in London should prove of special value as showing clearly what sort of feather the manufacturer specially desires, and the classes always to be avoided as far as posible.

Buying Orders for American Market.

Wing Feathers.—Soft flue and narrow feet (that means tapering feathers) to be always avoided.

Length varies with fashions, but we should say that on the average for the last twenty years three-quarters of the orders have been for long feathers.

Hard flue and broad feathers with good round tops always ordered, and we try to avoid feathers with a thin or weak flue.

Blacks.—Soft feathers and drabby or bronzy feathers to be avoided, also narrow feet. Of course, all bright black is best, but mottled or tinged take the dye almost as well. *Length varies* with fashion, generally some of all sorts are ordered.

Spadonas are generally ordered long, broad and light, and not having dark tops, but these are often used for backing other feathers, in which case the colour does not matter. Of course, ideal feathers would be very broad all the way with good round tops, hard flue, and a light *quill* to get a better count.

We also often get an order for good narrow feathers, and these generally have a hard flue and a rather heavy quill. They are generally used for backing.

Thin broad feathers with a fairly good shape are also used for backing, and are a sort of skeleton of the better sorts.

Single feathers are seldom used, but there has been a fashion lately for this class, and, of course, they have to be exceptionally fine to look at all decent, as a great many feathers are used for the ordinary plume that one sees in hats, a dozen or so being quite common, as they are backed, and false tops put on.

Drabs.—Avoid soft femmy. Drabs are as a rule a bad-shaped feather.

Blacks have deteriorated in colour very much during the last fifteen years, and are not so bright, but more drabby or bronzy than they used to be.

As before stated, each individual feather was valued and commented on. The valuation as given below is merely comparative, as a certain percentage in proportion to the value of the feather has been deducted in each case to obviate any trouble that might arise between sellers here and buyers across the water. Nevertheless, the proportional value of each feather being retained permits of every farmer comparing the reasons why one feather was valued higher than the next.

		per lb £	s.	d.
1.	*White*, rather barred, one-sided, not broadest	30	0	0
2.	*White*, fair flue, not broadest	28	0	0
3.	*White Femina*, good, very broad	24	0	0
4.	*Grey Femina*, fairly broad, rather one-sided, light	16	0	0
5.	*Long Black*, narrow head, rather one-sided	9	0	0
6.	*Long Black*, broad head, rather one-sided	9	5	0
7.	*Long Drab*, good shape, very barred	6	0	0
8.	*Drab*, short long, rather barred	3	5	0
9.	Femina Tail, white flat, good	4	10	0
10.	*Femina Tail*, greyish barred	3	5	0
11.	*White Boos*, very broad, not longest	5	10	0
	(1) Black Bottom, barred, very broad	2	5	0
1.	*White*, very long, even shape, discoloured, light	35	0	0
2.	*White*, very long, fair head, *narrow bottom*, barred	32	0	0
3.	*Feminas*, white, very long, fair width fair shape	21	0	0
4.	*Long Black*, very broad, curly, good shape, ¾ length	10	0	0

			per lb. £	s.	d.
	5.	*Long Black*, good head, narrow bottom, ¾ length ...	9	0	0
	6.	*Long Grey Drab*, good shape and flue, feminy	6	10	0
	7.	*Long Drab*, good shape and flue	6	0	0
	8.	*Long Drab*, short long, good shape and flue	5	0	0
	9.	*Femina Tail*, light grey, very broad	5	0	0
	10.	*Femina Tail*, greyish, very broad, slightly barred ...	4	0	0
	11.	*White Boos*, very broad, good shape, not longest ...	6	0	0
C.	1.	*White Femina*, long, large, strong, rather barred ...	23	0	0
	2.	*Fancy Femina*, well marked, brownish, large, long ...	16	0	0
	3.	*Long Drab*, long, good, blacky	7	0	0
	4.	*Tail*, large, broad, black bottom	3	5	0
	5.	*Femina*, large, light grey, slightly barred	17	0	0
	6.	*Long Grey*, long, drabby, broad	8	0	0
	7.	*Long Drab*, long, very broad	6	10	0
D.	1.	*Grey Femina*, long light, greyish	20	0	0
E.	1.	*White*, long thick flue, good quality, not broadest ...	28	0	0
F.	1.	*White*, long, quilly, narrow bottom, narrowish	20	0	0
	2.	*Black*, large heads, narrow bottoms, good quality ...	9	10	0
	3.	*White Boos*, large, good	6	10	0
G.	1.	*White*, long, good shape, broad head, slightly barred ..	37	0	0
	2.	*Femina*, whitish, not broadest	16	0	0
	3.	*Femina*. whitish, longer, fair shape	18	0	0
	4.	*Long Drab*, good head, narrowish bottom	6	0	0
	5.	*Long Drab*, good head, Feminy	6	0	0
	6.	*Black*, three-quarter length, soft, one sided	7	10	0
	7.	*Femina Tail*, very broad, light grey	4	5	0
	8.	*White Boos*, medium size, not best	3	5	0
H.	1.	*Drab*, long broad, rather pointed heads	6	0	0
	2.	*Femina Tail*, very large, Drabby	3	0	0
	3.	*Black*, three-quarter length, broad head	9	10	0
I.	1.	*White*, long rather pointed heads, rather barred, soft, rather woolly	35	0	0
	2.	*Femina*, fairly white, *very, very broad*, good	23	0	0
	3.	*Grey Femina*, large, slightly marked	18	0	0
	4.	*Black*, large medium, very broad	8	10	0
	5.	*Femina Tail*, very large greyish	4	10	0
	6.	*Long Drab*, short long, narrowish bottom	3	10	0
	7.	*White Boos*, *reddish*, soft	3	0	0
J.	1.	*White*, very long, quilly, thin, not best shape	30	0	0
	2.	*Femina*, very long, quilly, thin	15	0	0
	3.	*Black*, thinnish, dullish	7	0	0
	4.	*Long Drab*, fairly broad	6	10	0
	5.	*Femina Tail*, very broad, barred, thinnish	3	10	0
	6.	*White Tail*, large, thinnish	4	10	0
K.	1.	*White*, long, *very one-sided*	18	0	0
	2.	*White*, *very, very broad*, willowy, thin, soft	24	0	0
L.	1.	*Bycock*, slightly marked, discoloured, barred soft ...	11	0	0
	2.	*Bycock*, well marked, fair	10	0	0
M.	1.	*White Femina*, long, good shape, broad, fair flue ...	24	0	0
	2.	*White Femina*, very long, good shape, good head ...	23	0	0
	3.	*Grey Femina*, large, good, grey head	20	0	0
	4.	*White*, very long, strong, fairly broad	35	0	0

For the sake of assisting farmers who have not had the opportunity of seeing these feathers—though they were lectured on and exhibited in most of the leading ostrich districts—a number of photographs have been taken of some of the most distinct types for the purpose of showing the good and b ˡ points and the difference in valuation due to these. However, before ˬ :menting on these defects, it will be as well to go into the following scale of points, the one marked A compiled from the European judgment of the feathers, and that marked B by those of our leading feather dealers or experts in Port Elizabeth, who were good enough to judge a number of sets of these feathers at the time the recent Ostrich Farmers' Congress was held at Port Elizabeth. From the photographs, scale of points and judgment of three typical specimens given below, it will easily be seen why the judges awarded the points as they did.

A. *European.*	Full Points		No. of Feather, No. 2. Points awarded.	No. of Feather, No. 4. Points awarded.	No. of Feather, No. 5. Points awarded.
1. Length	12		12	10	12
2. Width	12		12	10	12
3. (*a*) Full tip...	6	27	6	3	4
(*b*) Evenness of flue	9		8	9	4
(*c*) Square butt	12		11	12	12
4. Density	10		9	10	6
5. Freedom from woolliness ...	12		10	11	6
6. Strength of Flue	12		12	12	0
7. Freedom from Bars	10		9	10	9
8. Quill	5		4	4	0
Percentage of Points ...	100		93	91	65
B. *Port Elizabeth Judging.*					
1. Length	14		12	14	12
2. Width	11		11	9	11
3. Density	14		13	13	6
4. Shape	11		11	9	0
5. Bars	10		9	10	9
Total Points awarded ...	60		56	55	38
Percentage of Points ...	100		93·3	91·6	63·3

The reader should here refer to the illustrations of the feathers.

Feather No. 2 does not show up as well as might have been desired, but this was due to the fact that the back of the feather faced the camera for an illustration produced lower down to show the strength and weakness of flue in two wide feathers, whereas 4 and 5 faced the camera. The difference between 4 and 5 is very marked. 5 is a thin, uneven, weak, cottony, flued feather, with an extraordinarily heavy quill.

The European valuation of the three feathers at per pound according to the sample is as follows:—No. 2, £37; No. 4, £35; No. 5, £24. A fact worthy of note is how nearly the European and Port Elizabeth judgments coincide. With No. 2 there is only a difference of ·3, with No. 4, ·6 and with No. 5, 1·7.

Illustration No 1, representing feathers 1 and 4, has been inserted to show the difference between a feather with a broad, full butt or foot and the opposite No 1 is typical of feathers described in the trade as having narrow feet, a point commented on by every authority, and one which reduces the value of the feather very considerably Every endeavour should be made to breed away from this type, and to produce birds with a full broad butt such as No 4 represents

In illustration No 2 we have two typical feathers showing strong and weak flue These two feathers were suspended lengthwise each on two pins in a perfectly natural position It will be noticed with feather No 4 the flue facing up is strong and self-supporting and runs out at right angles to the quill The points of the flue both along the upper and lower edge of the feather are perfectly even and for the most part broad and blunt at the *tips* The barbules if examined closely will—even in the photographs—show that these lie flat and closely packed, which gives the feather a fine lustre

With feather No 5 the flue is weak, soft and cottony, it cannot support itself and is, according to both the European and Port Elizabeth judges, a most undesirable type of feather The flue is also discoloured, needle-pointed and most uneven, some points being far longer than others The barbules will also be noticed to have a stairy appearance, making lustre an impossible feature in this feather

In illustration No 3 the same two feathers are represented as in No 2, with this difference, that in this instance the feathers are standing up right The strength of flue in the one case and the weakness in the other is again clearly seen

Feathers like No 5 are largely used for making first class boas, according to the European report, and cannot, therefore be expected to fetch anywhere near as much per pound as feathers of the type to which No 4 belongs, which are suitable for plume making

Feather No 2 in illustration No 4 shows the full, broad, dense heavy, round tip so much desired, in fact this feather has as fine a tip as is likely to be found, whereas No 3 shows a thin, narrow, pointed tip The flue of No 2 was especially pushed back so as to make the tip more noticeable

The feathers 6 and 7 in illustrations Nos 5 and 6 are two very perfect specimens It will, however, be noticed that the flue on the one side of No 6 is longer than on the other This is a serious defect in some feathers, in fact one specimen sent to England, though practically perfect in every respect, with the exception that the flue on the one side was quite two inches shorter than the other, was only valued at £17 But for this defect the value would have been quite £30 Of course, this was an exceptionally bad case, but it only goes to show what extreme care must be exercised in selection and breeding

An endeavour was made in illustration No 7 to reproduce a feather very nearly perfect, and one far removed from this state The feathers were stood up flat against a board with their backs to the camera to show up every part, but it was found most difficult to get them to show up well However, No 2 was valued at £37, and scored the highest number of points, and No 5 was valued at £24, and received a relatively low number of points

Other countries are now entering into competition with Cape Colony in this particular branch of farming, namely, feather production, and it is hoped that all ostrich farmers will continue to improve their stock, as it is only by producing the best article, and the article most desired by the manufacturers, that we can hope to maintain the lead that we now have As long as we produce the best article of its kind in the world, and the one sought after by the consumer and manufacturer, we will undoubtedly hold the market by this means and no other.

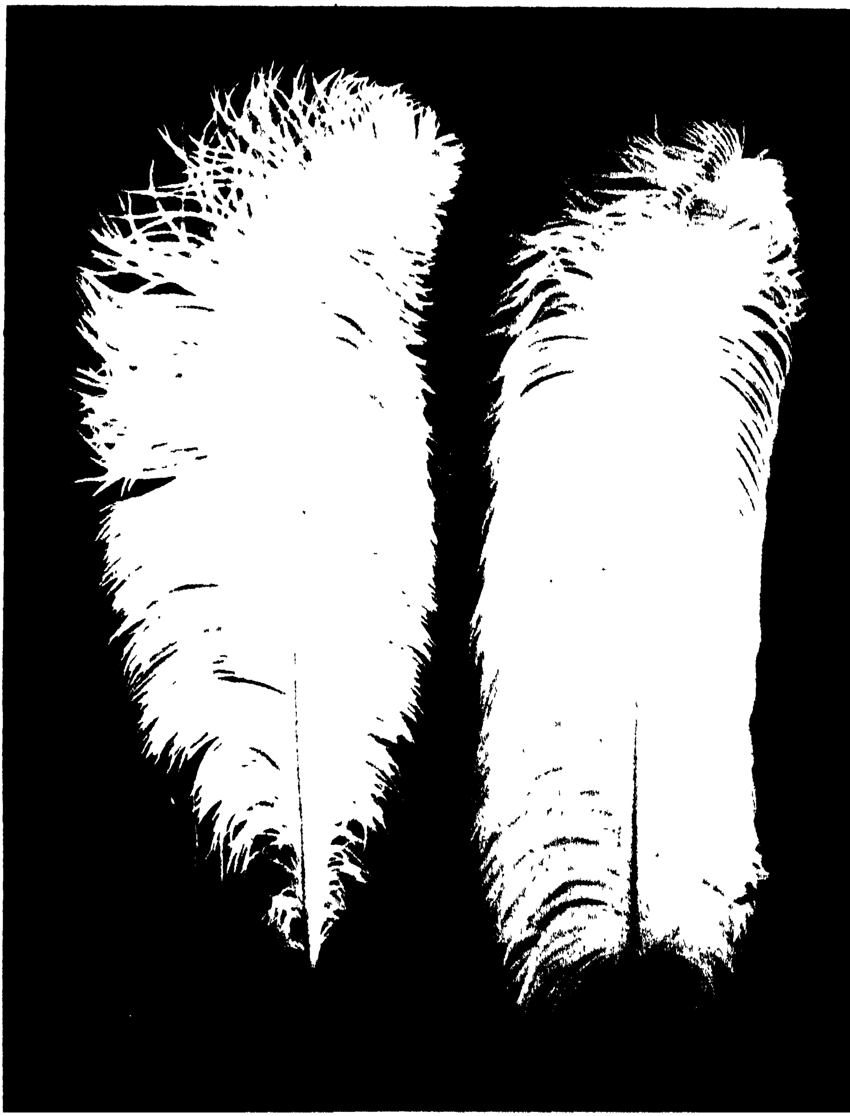
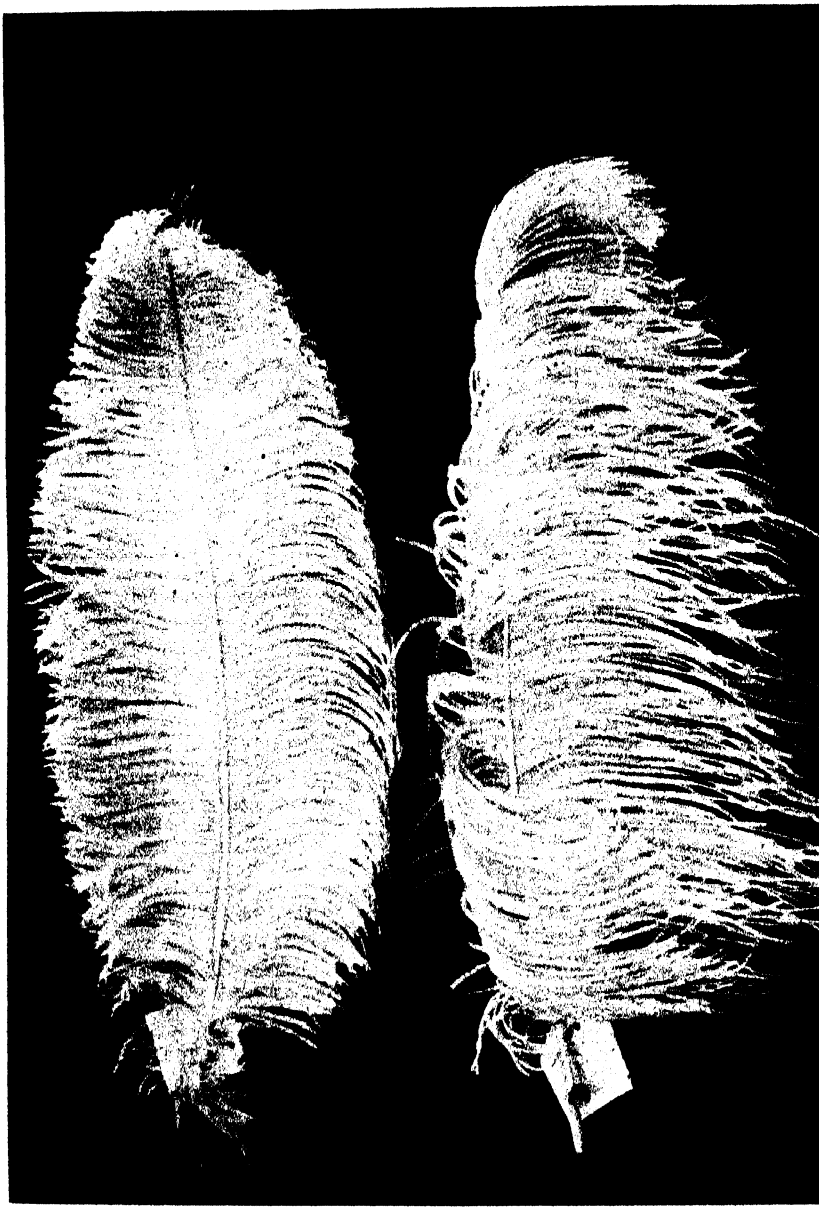


FIG. 1

FEATHER 1 FEATHER



G. 2

FEATHER

FEATHER

FIG. 3.

FEATHER 4. FEATHER 5.

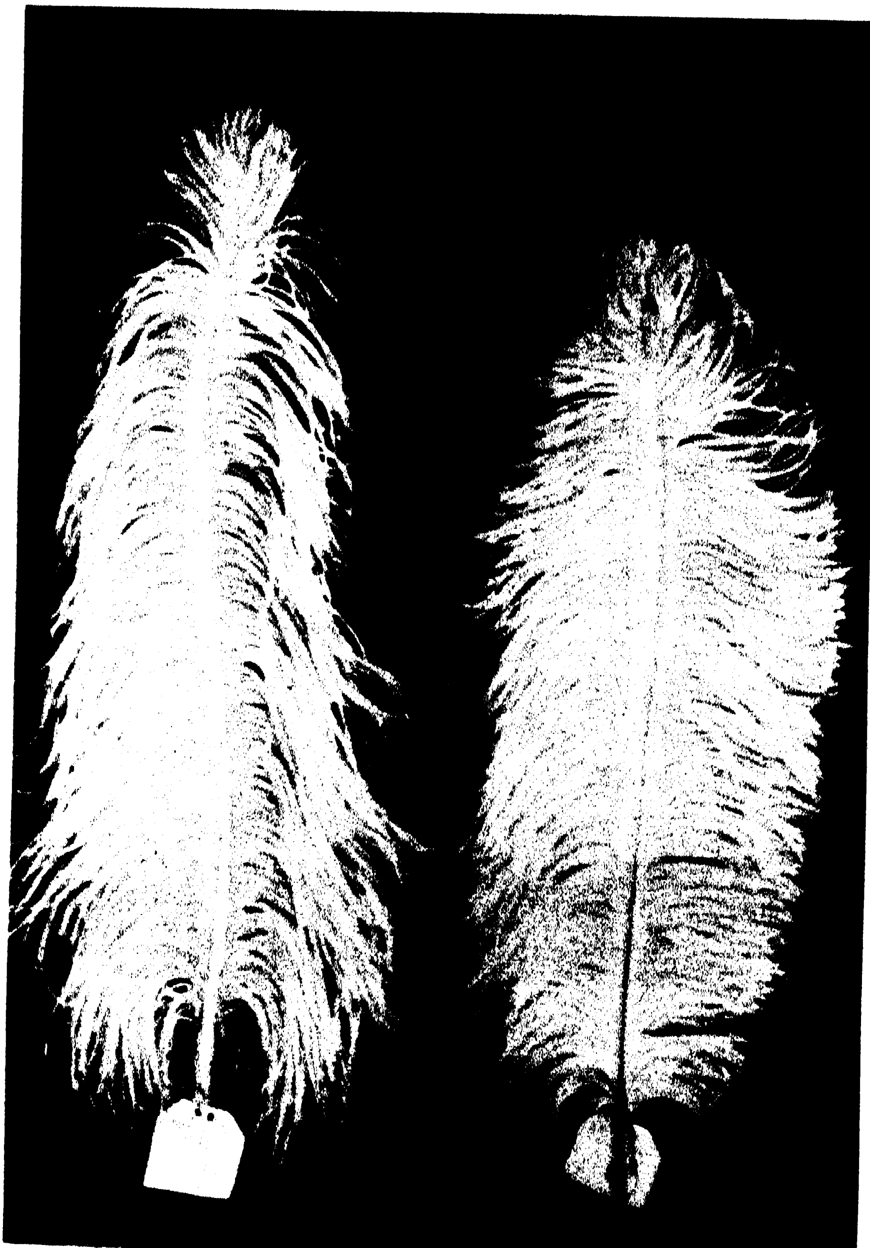


Fig. 4.

Feather 2. Feather 3.

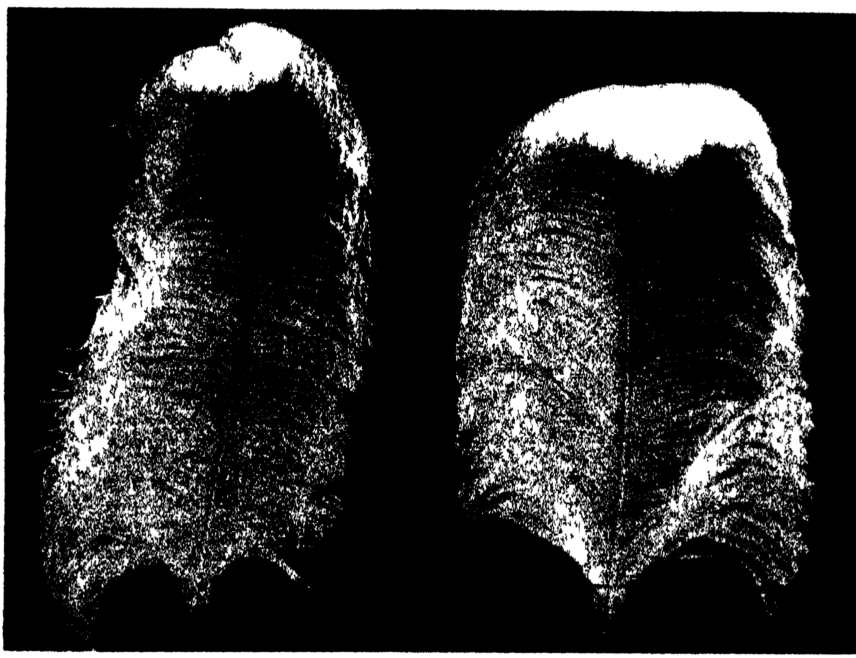


FIG. 5.

FEATHER 6. FEATHER 7.

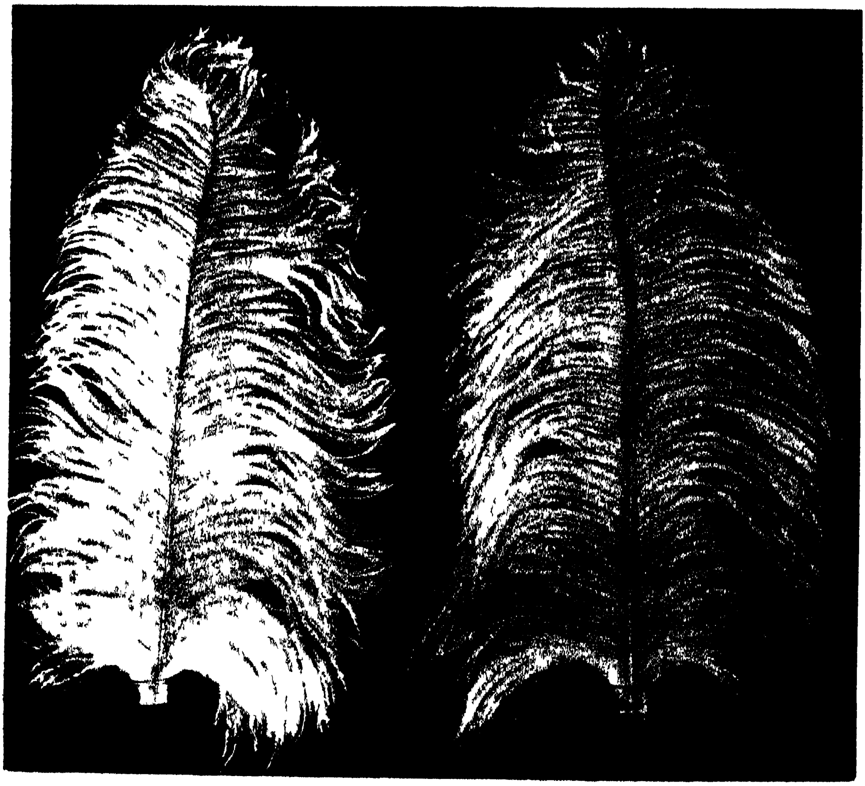


FIG. 6.

FEATHER 6. FEATHER 7

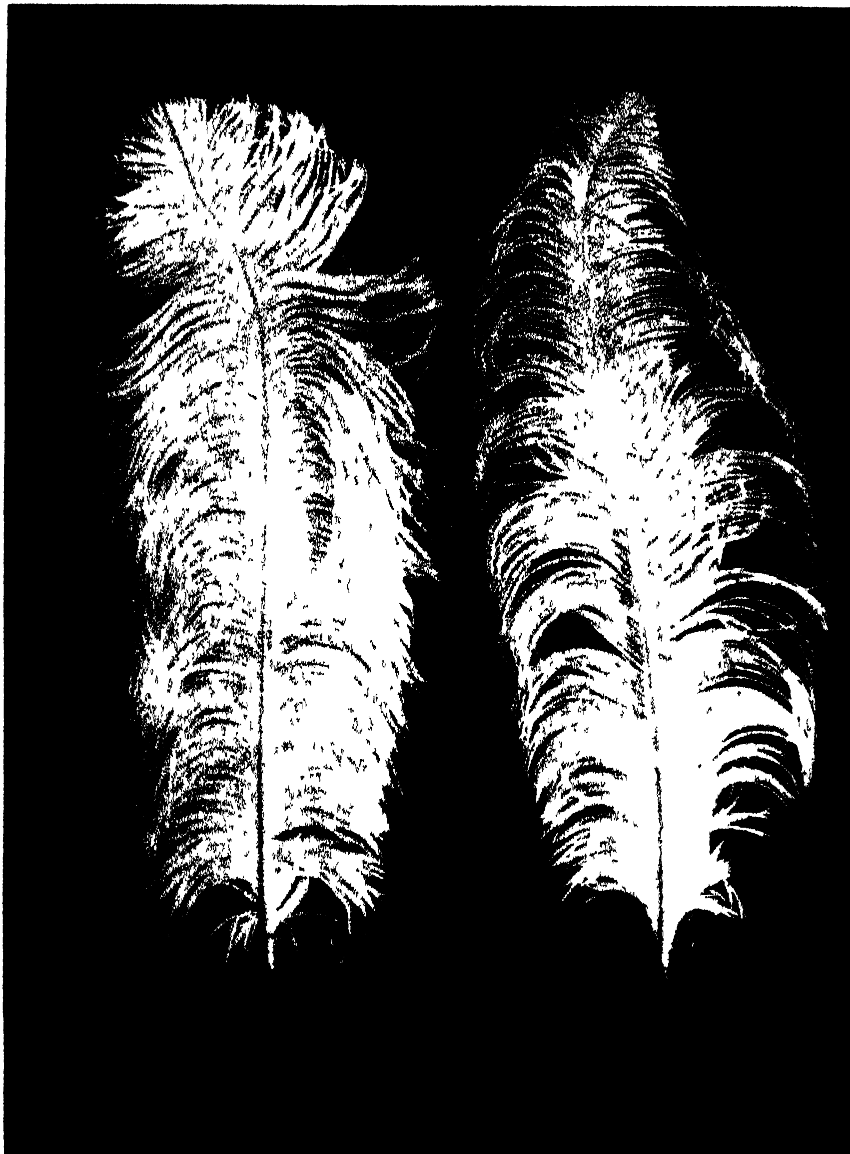


FIG. 7.

FEATHER 5. FEATHER 2.

FIG. 1

A spadona with an almost total absence of barbules. The feather consists of only shaft and barbs

FIG 3.

An Oudtshoorn feather with three defective areas due to the absence of barbules. The uppermost is the broadest and represents over a week's growth during which the bird was out of condition. The feather also shows a few shrinkage bars

EXPERIMENTS WITH OSTRICHES—XII.

HOW WEAKNESS AND DENSITY OF FLUE ARE PRODUCED.

By Professor J. E. DUERDEN, M.Sc., Ph.D., A.R.C.S., Rhodes University College, Grahamstown.

A clipping of spadonas recently received from Mr. F. R. Edwards, Wijers River, through the Editor of the *Agricultural Journal*, is of more than passing interest, in that it sheds much light upon the influence of nutrition and blood-pressure in the production of a weak or a dense flue. One of the feathers is shown in the accompanying photograph (Fig. 1), and differs from ordinary plumes in presenting an almost entire absence of barbules on the flue. The shaft and also the barbs coming from each side of it are normally developed, but only here and there can the merest traces of the barbules be recognised. Such a feather would be practically valueless for the usual purposes for which ostrich plumes are employed. While such extreme cases are rare, it is by no means unusual to find plumes in which the barbules are shorter than desirable, either over the entire feather or in places.

THE STRUCTURE AND NUTRITION OF A GROWING FEATHER.

To understand how such a plume as that shown has been produced requires a knowledge of the microscopic characters of the feather at its earliest stage of growth and also of its method of nutrition; but such a knowledge is well worth a little trouble to acquire from the explanation which it affords of many other problems connected with feather growth. If a thin cross section be made of a feather, while it is still soft and plastic in the lower part of the feather socket, the following parts will be recognised, and are diagrammatically shown in Fig. 2. The middle or interior of the feather is occupied by what is known as *pith* or *medulla*. This consists of a tissue of loose cells, among which is an extremely rich supply of blood-vessels—arteries, veins and capillaries. The blood is for the nourishment of the growing feather, and one easily realises how rich is the supply by the amount of bleeding or hæmorrhage which takes place when an unripe feather is clipped or punctured in any way; also when it is remembered that a wing feather grows at the rate of about a quarter of an inch a day, the need for such a copious supply of the nutrient blood is apparent. As the feather ripens the blood drains from it and the pith dries up, the space it occupied then becoming filled with air.

At the outer surface of the pith is a layer of cells which gives rise to the *horny sheath of the medulla*. This sheath is best seen in the older parts of the growing feather, and remains as a horny tube in the middle of the unopened feather after the pith dries up. As the feather expands it is,

however, preened away by the bird, but it can be seen enclosed in the middle of the ripe quill as a series of horny cones fitting over one another.

Next the medulla sheath is a series of cells arranged for the most part in wedge-shaped groups, as seen in transverse section. *It is from these cells that the entire feather is formed, the pith taking no part in producing the feather beyond serving to nourish the growing cells.* One of the groups of cells is much larger than the others, and this forms the shaft of the feather, while the numerous smaller groups of cells on each side give rise to the barbs and barbules of the flue. The barbs, however, are formed from the cells nearest the pith, that is, from those which are nearest the supply of nutrition, while the barbules are formed from the cells further away. No blood-vessels occur among these feather-forming cells, consequently they have to depend for their nutrition upon the fluid or plasma part of the

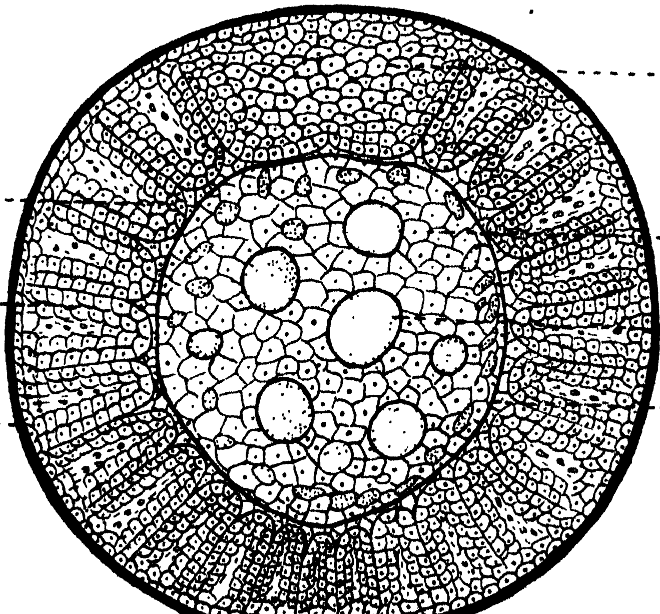


Fig. 2.—Transverse section of a feather at a very early stage of its development while soft and p astic within the socket (diagrammatic). In the middle is the pith or medulla containing the blood-vessels, through the walls of which the blood-plasma exudes to nourish the growing feather cells outside. Around the medulla is the medullary sheath, which remains after the blood has receded and the pith dried up. The cells outside the medullary sheath give rise to the feather and are without blood-vessels. The large group at the top of the figure will give rise to the shaft of the feather, and the wedge-shaped groups along each side to the flue, the barb-forming cells being inside and the barbule-forming cells nearer the outside. Surrounding the entire feather is the feather-sheath, which is preened away to allow the plume to open out as it ripens. *a*, shaft-forming cells; *b*, medulla or pith; *c*, blood-vessel; *d*, medullary sheath; *e*, feather sheath; *f*, barbule-forming cells; *g*, barb-forming cells.

blood which oozes out through the thin walls of the vessels in the pith; spaces, known as lymph-spaces, are found among the cells, and these are filled with the nutrient blood-plasma or lymph, which thereby bathes and nourishes the cells.

Outside the wedge-shaped groups of cells which form the flue and shaft is a layer of cells which gives rise to the *horny sheath of the feather.* This sheath completely covers the feather before it expands, but is preened away

by the bird as the feather ripens, and thus allows the flue inside to open out.

It is necessary to bear in mind that in the growing feather the blood and blood-vessels are confined to the pith; as already stated, *no blood-vessels are ever found among the cells which form the actual feather.* The cells forming the feather substance correspond with those which constitute the outer layer of our own skin (epidermis), and also give rise to the covering of hair; this outer skin in ourselves also is devoid of blood-vessels and nerves. The pith or medulla of the feather corresponds with our under-skin (dermis), which is well supplied with both nerves and blood-vessels. This being the case, it is manifest that the cells forming the feather must receive their nourishment by exudation of the fluid part of the blood through the thin walls of the vessels in the pith, and the blood-plasma must pass by diffusion among all the cells as far as the surface or feather-sheath. The cells nearest the pith will receive their nourishment first, and these are the cells which will ultimately give rise to the barbs, while those more distant, which give rise to the barbules and feather-sheath, will get their supply of nutritive fluid later. Should there be a deficiency in the nutrition of the growing feather the barbule-forming cells will suffer first, and the barb-forming cells later.

PRODUCTION OF FEATHERS WITHOUT BARBULES.

With the above facts before us as to the nature of the growing feather and its nutrition, we are in a position to understand the production of a feather devoid of barbules, such as that shown in Fig. 1. For some reason the amount of nutritive fluid exuding from the pith to the feather-forming cells around it has been sufficient to supply only the nearest cells, or those which give rise to the shafts and barbs; the fluid was absorbed before it reached the outer cells which give rise to the barbules, and therefore the barbules are absent or very imperfectly formed. The feather cells can only grow and multiply in proportion as they are supplied with nutritive materials from the blood, and either from lack of quantity or insufficient pressure, these materials have not penetrated to the barbule-forming cells.

Without an examination of the chick at the time the feathers were growing, or a knowledge of its food and surroundings, it is impossible to say what was the cause of such a defective nutrition of the feather; but whatever the cause, it must have been present all through the six months necessary for the growth of the spadona. The chick may have been in a very weak state of health from deficient food or some ailment, and hence the supply of blood to the growing feather was sufficient only for the cells forming the shaft and barbs; or, more probable, in its food was included some weed or grass, the action of which is to reduce the superficial blood-pressure, and therefore the pressure on the nutritive fluid was insufficient to force it to the cells furthest away from the central pith. This latter suggestion seems more likely from some recent experiences in Oudtshoorn described below.

Since receiving the feathers, however, inquiries have been made among other ostrich farmers as regards the frequency of occurrence of birds with barbuless feathers, and some important facts have been elicited which call for a different interpretation. Mr. C. Gardner, of Harvest Vale, has sent a clipping of similar spadonas, and states that every feather on the bird, including the body-feathers, is of the same type. The bird is one of a large clutch of chicks, and none of the others are affected, although all the chicks have been treated alike. Mr. Lappan, near Grahamstown, also mentions an interesting case in which a bird from the chick stage onwards always gave a crop of feathers without barbules. None of the other birds in the

troop showed a similar deficiency, but each clipping of this particular bird was always devoid of barbules and all the body-feathers were of the same nature.

With these cases before one, and probably others will be forthcoming now the attention of ostrich farmers is drawn to the matter, it would appear that the production of barbuless feathers is constitutional for the particular bird, not something dependent upon its food or surroundings, otherwise successive clippings would not show the same defect without any of the other birds in the troop being affected Also the farmer cannot look forward to the bird ever recovering and growing an ordinary crop, though it need not influence any offspring The defect is apparently inherent in the bird, something constitutional which interferes with the proper development of the barbule-forming cells If physiological experiments could be carried out they might show that a low blood-pressure is characteristic of the birds through some malformation in its organs

A New Type of Defect in certain Feathers from Oudtshoorn

A defect of a nature similar to the above was prevalent in some of the Oudtshoorn feathers in the early part of the present year, but in this case fortunately only a small part of the entire feather was affected. It created considerable interest at the time, being a new type of defect to most ostrich farmers. Specimens of the feathers were kindly forwarded me by Mr. A. Auret, of the Civil Commissioner's Office, and Mr. Wm. Taylor, Secretary of the Oudtshoorn Farmers' Association One such plume is represented in the accompanying photograph (Fig. 3) It will be seen that at two places there is a defect in the flue extending as a broad band across the feather, and due to a complete or partial absence of the barbules, while further down the feather is a third narrow defective band. Each defective area passes gradually, not suddenly, into the normal portion of the feather, and except at the three bands the flue is of the well-known density, strength and richness so characteristic of Oudtshoorn feathers. In some birds all the feathers were defective in this way, while in others only old plumes suffered.

In this case it is evident that whatever caused the defect was only of short duration in its action, certainly lasting not more than a week or two. It can scarcely be imagined that the birds as a whole, kept under the stimulating Oudtshoorn conditions, had been reduced in their general nutritive condition for such a short period and then recovered almost as quickly. From what we know of the growth of the feather it seems more reasonable to suppose that the birds had eaten some plant or shrub which had the effect of reducing the superficial blood-pressure to such an extent that the barbule-forming cells were deprived of their nourishment for the time being. Inquiry among the Oudtshoorn farmers elicited the fact that all the growing feathers were affected at the same place, and that the trouble was not due to drought or poverty, the birds being in good condition all the time. The idea was expressed that the birds were poisoned by eating Malva (Kissie Blaar). Six birds in the camp died, and also two horses, as was supposed from eating the mallow. The birds were noticed to tremble all over the body after they ate the Malva.

From all one can gather, the trouble in Oudtshoorn commenced when some of the lucerne pastures at the end of the winter season had become infested with grass and weeds as a result of winter rains when the lucerne was not growing. Under such conditions it is easy to understand that some noxious or poisonous weed may have appeared in the pastures, or that the food may have disagreed with the birds in some way. Ordinarily the Kissie Blaar is supposed to be a harmless demulcent weed, and in places is

eaten by stock, but there seems to be some evidence in support of the contention of the Oudtshoorn farmers that at times it may be harmful. Some farmers will certainly not allow their horses to eat the Malva.* The whole subject is of much interest, and may become of importance should the defects recur from time to time; undoubtedly we have some poisonous weed which is capable of influencing the blood-pressure of a bird to such a degree that the barbules do not form on the growing feathers. A careful study on the spot would probably reveal the cause, and an investigation should be undertaken if the trouble breaks out again. At the present stage we can only explain how the trouble has been produced without knowing the cause.

Comparison of the Oudtshoorn Defects with the Ordinary Shrinkage Bar.

One is naturally inclined to compare this new defect with the ordinary shrinkage bar with which the ostrich farmers everywhere are familiar. In the last number of the *Agricultural Journal* a full account was given of how the shrinkage bar is produced, namely, by the wrinkling of the feather-sheath upon the soft growing feather at the region of the weaker night rings. In the shrinkage bar the defect is always very narrow, being only the width of a night ring, that is, about a sixteenth of an inch; moreover, the shaft and barbs are often indented by the wrinkling, while the barbules are usually present, but not properly separated from the barbs. In this Oudtshoorn trouble the barbules have either not been formed or are very rudimentary, there is no kinking of the barbs and shaft, and the defect is continuous for both the day and night growth, having certainly lasted over a week in the case of the first and second attacks, though shorter in the third. It points to some continuous ailment in the bird as a whole. While primarily the shrinkage bar is due to the differences in blood-pressure, it is only the difference between the day and night periods which has to be taken into account; in this newer defect also we have a diminished blood-pressure to deal with, but it is continuous, irrespective of the day and night changes. The physiological causes of the two defects are therefore altogether different. The one is much rarer and should be easy of remedy if, whenever it appears, an examination is made of the weeds the bird is feeding upon, while the other is more constitutional and dependent upon the general condition of the bird influenced by climatic and other changes.

How Dense Heavy Flues are Produced.

From Fig. 2 and the facts presented in connection therewith we are now in a better position to understand the physiological conditions under which a dense heavy flue is produced. A feather is very largely dense in proportion to the length of the barbules. Probably more than in any other way the present wave of feather improvement shows itself in an increase in the length of the barbule, though associated with it is an increase in width and length of the flue and a closer arrangement of the barbs on the shaft. In these improved feathers much depends upon the strain of the

*** The introduction of the question of the poisonous nature or otherwise of the Kissie Blaar (*malva parviflora*) before a recent meeting of the Upper Albany Farmers' Association brought forth expressions of opinion very divergent in their nature, some contending that the plant was perfectly harmless while others were just as convinced by their experience that it was poisonous. As soon as opportunity offers it is hoped to conduct experiments on the subject. It seems not unlikely that different plants may be included under the name Kissie Blaar, and in any discussion on the subject it is desirable that specimens of the plant should be forwarded to Dr. S. Schonland, Albany Museum, Grahamstown, who has kindly offered to identify them.**

bird, but probably quite as much, and in the opinion of many farmers even more, depends upon the nutritive conditions of the bird. Fig. 2 and its explanation shows how nutrition acts in influencing the feathergrowth. When a bird is in excellent condition from high feeding on lucerne or rape a more copious supply of blood circulates in the pith of the feather, more of the blood plasma exudes through the walls of the blood-vessels and bathes the feather-forming cells; this stimulates them to increased growth and multiplication, which means greater length and strength in all the parts concerned. The barbule-forming cells being furthest from the pith share in this increased nutrition to a greater proportionate degree than the barb-forming cells, hence we get an increased growth in the length of the barbule and the greatly desired density to the feather.

Whatever be the strain of the bird, a high-class plume is not produced unless the nutritive conditions are also favourable. The ostrich is exceedingly sensitive in this respect as regards its feathers, and probably most farmers have been disappointed at times in not getting from superior birds the superior clipping they were known to have produced in the district from which they were purchased. Do what he will and provide himself with the best strains possible, a farmer will not produce the best results unless the nutritive conditions for his birds are highly favourable, and knowing the nature of the parts of the feather we can now more readily understand how this comes about

FRUIT EXPORT.

Return of Fruit Shipped from Cape Colony during October, 1909

Port of Shipment.	Destination.	No. of Packages.	Description of Fruit.	Quantities.	Value.
					£ s. d.
Cape Town ...	German South West Africa	3	Loquats ...	*120	0 12 0
" ...	"	1	Peaches ...	26	0 10 0
" ...	"	2	Grenadillas...	800	0 15 0
" ...	"	2	Guavas ...	600	0 18 0
" ...	"	7	Cocoanuts ...	266	2 4 6
" ...	"	9	Pines ...	409	10 7 6
" ...	"	20	Pears ...	2,950	14 0 0
" ...	"	67	Naartjes ...	12,030	24 4 4
" ...	"	108	Lemons ...	15,220	38 6 6
" ...	"	51	Bananas ...	39,055	48 12 0
" ...	"	246	Apples ...	33,533	116 8 0
" ...	"	387	Oranges ...	46,890	160 9 0
Port Elizabeth	England	171	Oranges ...	5,880	42 15 0

* Signifies lbs. weight. The other quantities represent numbers of fruits.

AGRICULTURAL ZOOLOGY FOR SOUTH AFRICAN STUDENTS.

BEING A COURSE OF LECTURES ON AGRICULTURAL ZOOLOGY, DELIVERED BY DR. J. D. F. GILCHRIST, PROFESSOR OF ZOOLOGY AT THE SOUTH AFRICAN COLLEGE, IN CONNECTION WITH THE TECHNICAL EVENING CLASSES INAUGURATED BY THE SCHOOL BOARD OF THE CAPE DIVISION.

(Continued from Page 569.)

ARTHROPODA, OR ANIMALS WITH JOINTED LIMBS.

In the previous groups of the animal kingdom we have seen comparatively simple means of locomotion, such as by cilia, or simple muscular movement of the body aided in some advanced forms by bristles or by bristles supported on projections of the body. In the present group we find that cilia and bristles are absent and that the projections of the body are in the form of definite limbs or *jointed appendages* capable of sustaining the body and affording a much more effective means of progression. The name Arthropoda refers to these jointed limbs There is a *well developed cuticle* forming an exoskeleton of stout horny material, sometimes strengthened by a deposit of calcareous material. Thus protected by a hard exoskeleton and equipped with effective organs of locomotion, the group of the Arthropods need not crawl or wriggle about in sand or earth, but can come out into the open and walk on the ground or fly in the air. This new and diversified environment in its turn is associated with further changes. Thus there is now no typical form which has not *at least one pair of appendages modified for seizing and crushing food*, and in the higher forms the functions which the appendages may perform are very diversified. The segments of the body also become specialised and reduced in number—two processes which often seem to go together; thus the *number of segments is usually not more than twenty*. What the body has gained in strength, however, it has lost in mobility. It can now no longer so readily twist about in various directions, though between the segments the cuticle is softer allowing a certain amount of freedom, and it is possible that another outstanding feature of the Arthropods may be in some way connected with this, namely, that the *body cavity*, especially the perivisceral part, *is much reduced* and is represented only by the cavities of the reproductive organs and the excretory organs which are also reduced in number There is, however, a large irregular space between the muscles and organs of the body generally though it has no definite bounding wall, and is filled with blood. To distinguish such a space from a true coelom

or body cavity it is called a haemocoele In consequence of this arrangement we have other modifications; thus the blood does not require so many fine capillaries to carry it to and from the organs of the body which are now directly surrounded by blood. The heart is a tubular sac just under the dorsal surface of the body and it does not lie in a special sac as in higher forms but in a part of the haemocoele. In its sides there are a number of openings or ostia by which the blood passes into its cavity on expansion. When it contracts, these openings close automatically by valves, and the blood is forced into blood vessels which open into various parts of the haemocoele. The breathing apparatus of the Arthropoda varies very much in structure, and will be noted under the various sections. The nervous system is of the same type as that of the Annelida, consisting of a dorsal brain over the gullet and connected on each side to a ventral chain of ganglia. The sexes are always separate, and there are sometimes peculiar larval forms in the development of the young.

The Arthropoda may be divided into the following classes:—

I. CRUSTACEA, or forms which are adapted chiefly to an aquatic mode of life and retain the more primitive features of the Arthropod body. Examples are crawfish, lobsters, crabs and some forms which live on land, such as the Wood-louse.

II. PROTOTRACHEATA, a small group containing the genus Peripatus, which is of great interest as being a connecting link between the Annelida and Arthropoda.

III. MYRIAPODA or Centipedes and Millepedes

IV. INSECTA or Insects, including flies, moths, butterflies, bees, beetles, etc. These are Arthropods which have become adapted not only for terrestrial life but for flying in the air.

V. ARACHNIDA or spiders, scorpions, mites, and ticks, constituting a rather miscellaneous group, but one which can be separated from the other Arthropods

Class I.—Crustacea.

These are Arthropods which *usually live in water* and breathe by gills or by the general surface of the body. Their *appendages are often of the primitive type*, consisting of a basal part with two branches. The first *two pairs* are in front of the mouth and are *modified into antennae*; at least three of the succeeding postoral are modified into jaws. The chitinous cuticle is well developed and may be strengthened by carbonate of lime

PALINURUS (JASUS) LALANDII (Fig. 49), the Crawfish or Kreeft, is the most convenient type for the South African student in studying this group. The fresh water Crayfish (Astacus), usually taken as a type, is not found in South Africa, but a marine form (Astacus capensis) occurs, though it is very scarce. The Crawfish occurs in great numbers on the West Coast, but gradually diminishes from Cape Point eastwards, where however other species occur though not nearly so abundantly.

External Characters.—The body is covered with a hard shell consisting of chitin impregnated with carbonate of lime. At the joints of the limbs and between the segments of the body it is softer, and allows of a certain amount of free movement. This chitin is a secretion of the ectoderm, and it not only occurs on the outside of the body, but penetrates for a considerable distance into the digestive tract, and on the ventral side of the body is folded in to form a skeletal structure which is partly internal. At certain times the animal moults or throws off the chitinous skin (a process known as "ecdysis") chiefly to allow for growth of the body; the ectodermal nature of the various parts is then made clear, for not only is

the outer skin (chitinous or chitinous and calcareous) thrown off but also a large part of the alimentary canal as far as the stomach as well as the partly internal skeleton.

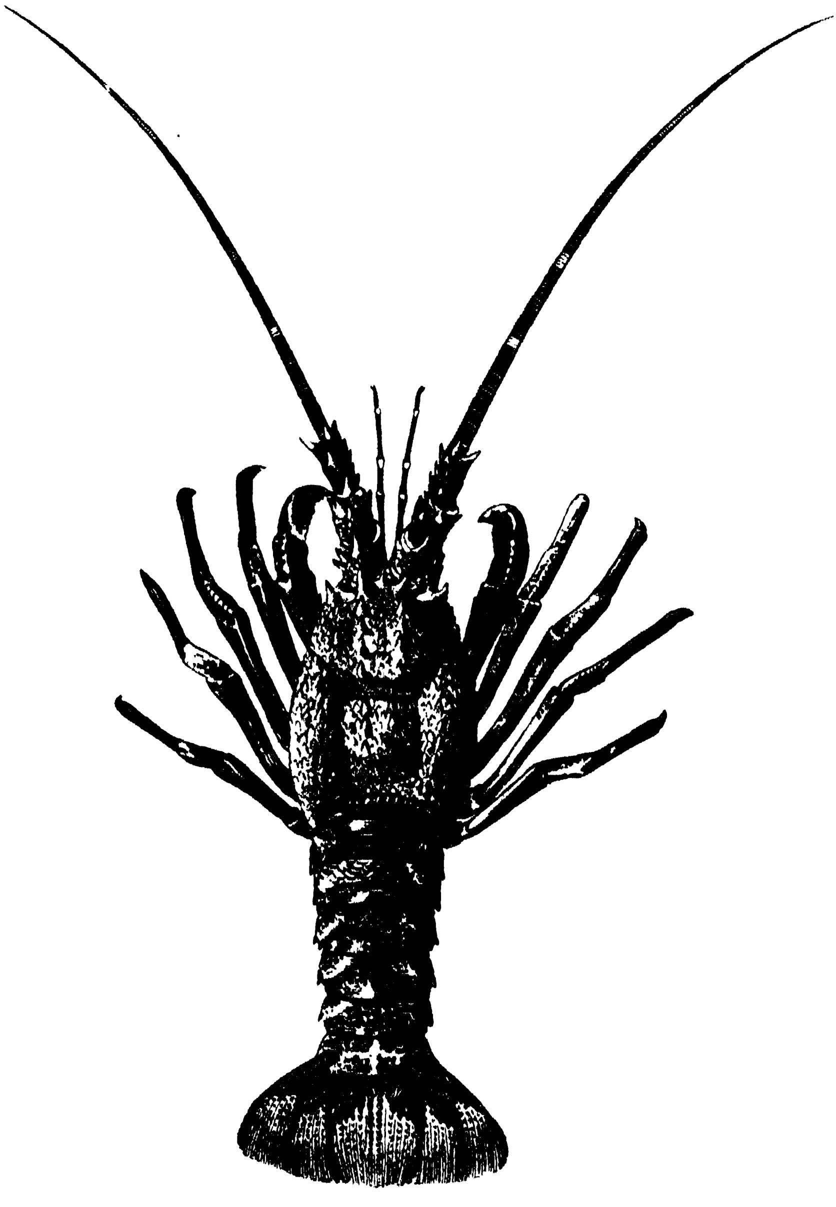


Fig. 49.—*Palinurus* (*Jasus*) *lalandii*. The Cape Crawfish or Kreeft.

The body consists of a head, thorax, and abdomen made up of segments. Except however in the abdominal region, usually called the tail, the segments cannot readily be made out. Those of the head and thorax are all fused together into a *cephalothorax* covered by one large shield-like *carapace*, which shows no traces of segmentation, though a

slight groove in it marks the division between the head and thorax. In addition to this neck or *cervical groove* there are lateral grooves marking off the central part of the carapace from its lateral expansion over the gills. The appendages however have not fused together, and if these be examined we find five in the head, and eight in the thoracic region, so that we may infer that there are in reality a corresponding number of segments in these regions. The seven segments of the abdominal region are distinct, so that there are thus twenty segments in all.

The appendages (Fig. 50) are therefore important external characters They are all modifications of a primitive type in which there is a basal part or protopodite and two terminal branches, an outer or exopodite and an inner or endopodite. It may be that the most primitive Crustacea were provided with such appendages and they appear also in the young (c.f. Fig. 51, C) though in the full grown animal they are much modified

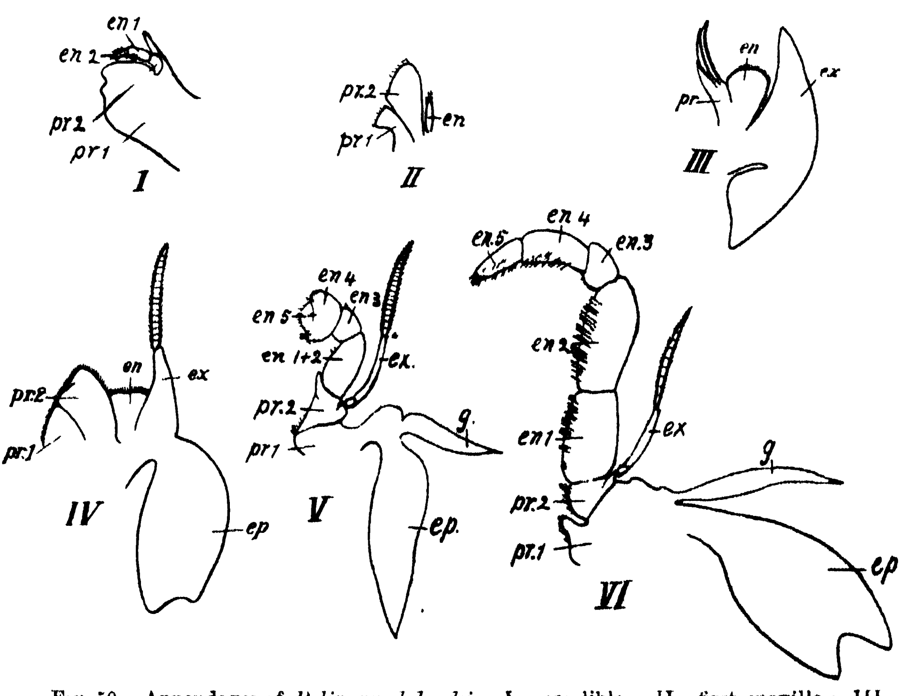


Fig. 50.—Appendages of *Palinurus lalandii*: I., mandible, II., first maxilla; III., second maxilla; IV., first maxilliped; V., second maxilliped; VI., third maxilliped; *pr.*, protopodite; *en.*, endopodite; *ex.*, exopodite; *ep.*, epipodite; *g.*, gill.

and the exopodite is often lost. Thus the early stages of the animal seem to be a sort of repetition or recapitulation of the ancestral history, a phenomenon which occurs in many other animals. This interpretation of the facts is known as the Recapitulation Theory which is that the development of the individual (Ontogeny) is a repetition to some extent of its ancestral history (Phylogeny); it is well illustrated in this group.

The *five pairs of appendages of the head region* are modified chiefly into sensory and mouth organs or jaws. The first, or *antennules*, are jointed rods and situated in the base of the first is the auditory organ, while the two terminal flagellae (probably not protopodite and endopodite) are associated with the sense of smell. The second are the *antennae*, with three basal joints and a long rather rigid flagellum (endopodite) provided

with short spines. It seems to act largely as an organ of defence. The third are the *mandibles* (Fig 50, I.) consisting of a protopodite of two joints, the first of which is a powerful hard jaw or mandible with blunt teeth, the second is small, and together with the two joints of an endopodite from a feeler-like organ or palp. The fourth are the *first maxillae* (Fig. 50, II.), which are very much reduced, each consisting of three leaf-like parts, thefirst two of which may be considered to represent a protopodite and the third a very much reduced endopodite. The fifth are the *second maxillae* which have undergone a peculiar modification. The protopodite has three pointed prolongations, the endopodite is leaf-like, and the exopodite has become a large fan-shaped organ, the baler or scaphognathite, by the movement of which a continuous stream of water is caused to flow over the gills.

Of the *eight pairs of appendages of the thoracic region* the anterior are modified as organs of mastication, maxillipeds or foot jaws, and the posterior as walking legs. The first of this is the *first maxilliped* of flattened protopodites and endopodites The exopodites has a feeler-like jointed flagellum, and attached to its base is a thin plate-like organ called the epipodite. The next pair of appendages is the *second maxillipeds*, with a two jointed protopodite and a large endopodite of four joints, the first of which however probably represents two. The exopodite resembles that of the first maxillipeds and in addition to an epipodite there is a gill attached at the base of the appendage The *third maxilliped* is somewhat similar to the second but is larger. This is followed by the five walking legs in which there is a basal two jointed protopodite, a three jointed endopodite but no exopodite. In the lobster the first walking leg ends in a powerful grasping pincer like claw or chela formed by the second last joint projecting along the side of the last. The freshwater crayfish also has some of the legs chelate, but there are no chelae on the legs of the crawfish except on the last in the female where a small one occurs, and in the male there is a small spine on the second last joint towards which the last joint can be directed.

There are *five pairs of abdominal appendages*. The first and the last segments have none, but the second to the sixth have flat leaf-like appendages. Those on the sixth segment have large exopodites and endopodites (uropods), and with the flattened terminal segment (telson) form a five-lobed tail-fin, by which the animal can swim rapidly backwards by sudden flexure of the abdominal region. The other appendages are smaller leaf-like organs (pleopods) consisting only of protopodites and exopodites in the male, but having in addition in the female well developed endopodites to which the eggs are attached after extrusion.

Alimentary System.—The *mouth* is bounded in front by an upper lip or labrum, at the sides by the mandibles, and behind by a pair of delicate lips or paragnatha, which are not appendages. The mouth is behind the antennules and antennae. It leads into a *gullet* lined with ectoderm and cuticle. There are glands on its walls, and it expands into a large stomach, which acts as a sort of grinding " gastric-mill " for the food, being provided with calcified teeth. All this is ectodermal and is shed when moulting occurs, a fact which may be sufficient to explain why a soft or " sick " crawfish will not take the bait. Behind this is a narrow and very short *small intestine* the only part of the alimentary canal which is of endodermal origin and has no chitinous lining. Into this small intestine open a pair of large glands which constitute what is known as the liver. It is followed by a wider *large intestine*, which is again of ectodermal origin and lined with chittin. In other words gullet and stomach are stomodaeal, the large intestine proctodaeal.

Vascular System.—The heart is an elongate sac-like organ with a number of apertures in its sides. These apertures are provided with valves by which blood can enter from the large space (pericardium) which surrounds the heart, but cannot pass out When the heart contracts, the blood is therefore driven into the arteries, which lead from the heart to various parts of the body, where they divide up into fine vessels or capillaries. The blood is not returned to the heart by definite veins, but is gathered into large spaces or sinuses, which have no definite walls and are therefore neither veins nor a body cavity but a haemocoele. The blood then passes to the gills and from thence to the large space in which the heart lies and which has also no definite walls and is part of the haemocoele

Respiratory System The gills are feather-like outgrowths of the body wall, situated on each side of the thorax and covered over by the lateral extensions of the thoracic shield Some of these are attached to the first joint of the appendages, where there is also a flat thin epipodite. Others are attached to the point where the first joint articulates with the body, and still others to the sides of the thorax itself.

Excretory System.—At the base of each of the antennae may be seen a little knob with an aperture in its centre. This aperture is the opening of the kidney or "green gland" an organ which corresponds to the nephridia in Annelids, and consists of a complex tube composed of excretory cells. Though it is to be regarded as a nephridium, it does not however open into a body cavity as in Annelids, though in some Crustacea it does open internally into a thin walled sac which may be regarded therefore as the remains of a body cavity.

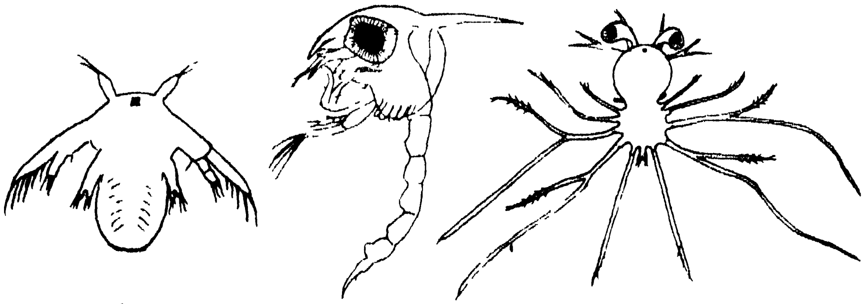
Nervous System.—This is of the usual Arthropod type, consisting of a brain over the oesophagus connected by commissures to a ventral chain of ganglia The eyes consist of a great number of facets beneath each of which is a separate set of visual cells The organ of smell is in the outer flagellum of the antennules, and consists of special cells provided with olfactory setae At the base of the antennules is a small sac open to the exterior by a small aperture, filled with sand grains and lined with setae; this is the auditory organ or ear, and the sand grains are renewed after each ecdysis. Setae occur in the body generally and may be tactile in function.

Reproductive System The female Crawfish may be distinguished from the male by its stouter build, the presence of small pincers or chelae on the last walking legs and of well developed endopodites on the abdominal appendages; the position of the genital openings is also different, those of the female being at the base of the third pair of walking legs, while those of the male are at the base of the fifth pair The testes form a lobed organ, and are each connected to the exterior by a long coiled tube or vas deferens. The sperms are non-motile bodies with stiff projections. The ovaries are also lobed organs, and they are connected to the exterior by oviducts, which are thicker and stouter than the sperm ducts.

Development.—The eggs are deposited on the under surface of the tail and become attached by an adhesive secretion to the pleopods. The sperms have been deposited by the male in this same region, and the eggs are thus fertilized. The eggs are provided with a good supply of yolk for the developing young, and they are carried about by the female on the under surface of the tail for some months before they hatch out. The young (Phyllosoma), when they first hatch out, are quite unlike the adult. They swim about in the water and are clear and transparent. The head and thorax are as yet separate from each other, and are round, very flat well developed regions of the body while the abdominal region is as yet extremely small. The walking legs are very long, and are biramous as are also the antennae. Figure 51, C, illustrates an embryo just hatched in

which some of the legs are biramous, and in which a small median eye occurs in addition to two well developed stalked eyes. At this stage the exopodites of the walking legs are segmented and provided with fine bristles. It is of interest to note that they are the swimming organs at this stage though entirely absent in the adult.

The class Crustacea may be divided into two sub-classes, the more primitive forms and the more specialised The first or ENTOMOSTRACA include a very miscellaneous collection of forms, which have little in common except that they do not show the more advanced structure met with in the second sub-class or MALACOSTRACA such as the definite number of segments and appendages and the teeth in the stomach; even their larval form is not so advanced, and they are usually of a much smaller size



A B C

Fig. 51.—Larvæ of Crustacea, A, nauplius of *Apus numidicus* (after Sars), B, zoaea of the crab, *Maja* (after Claus), C, phyllosoma of *Palinurus lalandii*

Sub-Class 1.—Entomostraca, or Small Simple Crustacea.

Simpler forms of Crustacea usually of a small size and with a variable number of segments and appendages (from about half a dozen to sixty or more). There are no teeth in the stomach A characteristic larval form often occurs in the development. It is called a *Nauplius* (Fig 51, A), and has only three pairs of appendages, the last two of which are branched. Its body is at first unsegmented, and there is a simple median eye. In many of the Entomostraca the upper part of the head region is continued over the body as a broad shield which may be single or double like the shells of a bivalve mollusc. The sub-class include the following orders:—

Order 1.—Phyllopoda.

As the name implies this includes forms which have flat leaf-like appendages of which there are at least four, but they may be numerous.

APUS (Fig. 52, A), of which several very large species are found in the South African Karoo and the South Eastern districts is one of the most interesting forms. It has numerous leaf-like appendages and a single large shield-like shell. STREPTOCEPHALUS (Fig. 52, B) and BRANCHIDODOPSIS, large forms without shield but with many appendages, are common as is also a form with a bivalve shell ESTHERIA (*e.g.*, E. Elizabethae from Port Elizabeth). These are long-bodied forms and have been called the BRANCHIOPODA. There are others which have much shorter bodies such as DAPHNIA, and are provided with a dorsal broad-pouch and have the second antennae very long; these are known as the CLADOCERA. Various forms of Phyllopods may readily be reared by placing some of the dried up

mud from pools and lakes in a jar of water After a time the animals hatch out from the eggs contained in the mud The specimens figured in Fig 51 A and Fig 52 A and B were hatched out from dried mud taken from South Africa to Europe

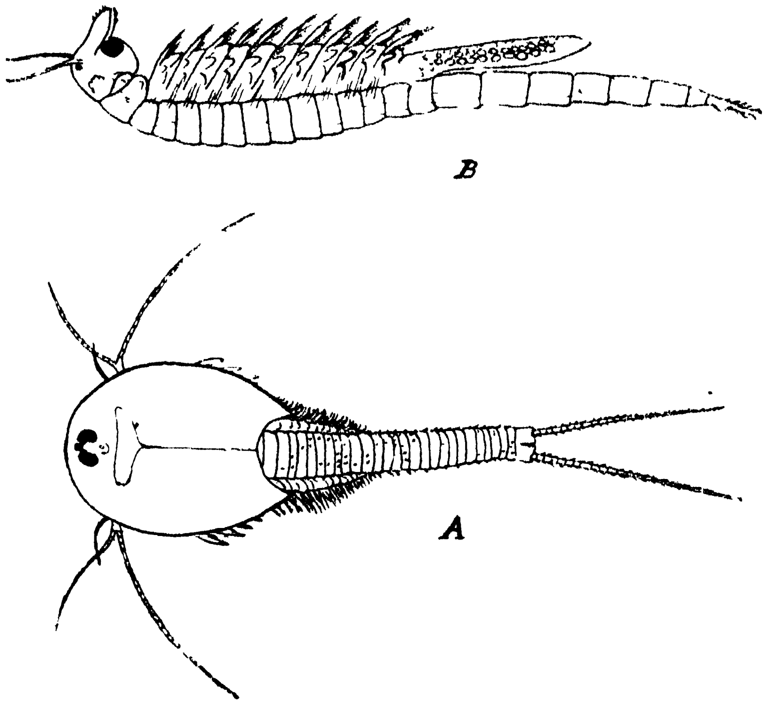


Fig 52. -Two South African Phyllopods, A, *Apus numidicus*, B, *Streptocephalus gracilis* (After Sars.)

Order 2.—Ostracoda.

The body is unsegmented and there are only seven pairs of appendages (Fig. 53). The abdomen is rudimentary The body is enclosed in a pair of shells so similar to those of a bivalve mollusc that they have been mis-

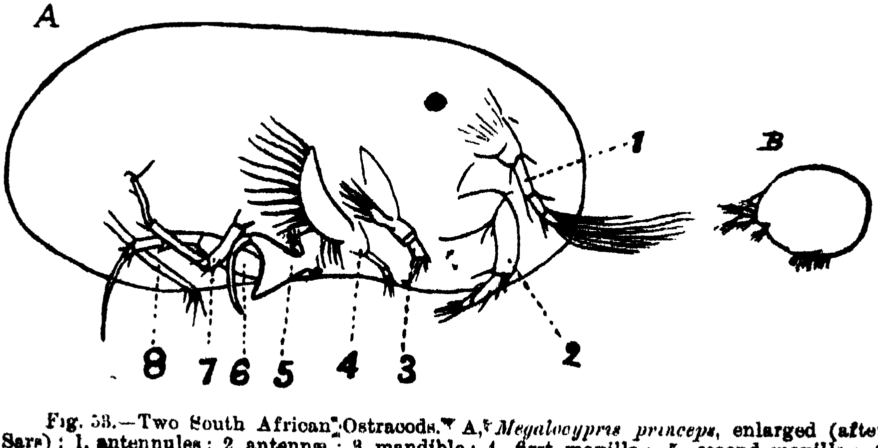


Fig. 53.—Two South African Ostracods. A, *Megalocypris princeps*, enlarged (after Sars); 1, antennules; 2, antennæ; 3, mandible; 4, first maxilla; 5, second maxilla; 6 and 7, feet, 8, caudal fork. B, *Orosophorus africanus*, natural size (after Stebbing).

taken for such. They are usually small, but in South Africa a large genus is very common in fresh water pools. It is called MEGALOCYPRIS PRINCEPS (Fig. 53, A), and is described as a "giant ostracod," attaining a length of 7 millimetres. A marine Ostracod subsequently discovered in South African waters attains a length of 15.5 millimetres (CROSSOPHORUS AFRICANUS, Fig. 53, B). They are important in the economy of equatic life as they act as scavengers, attacking and removing dead organic matter.

Order 3.—Copepoda

Like the last, the members of this order are of small size, but the body is elongate and distinctly segmented. The thorax has four or five pairs of biramous appendages. There are none on the abdomen. The eggs are carried usually in external sacs. CYCLOPS (Fig. 54) is an example of these Crustacea In this order there are many examples of extreme degeneration due to parasitic life. Thus they may appear as worm-like forms on the gills or skin or in the mouth of fishes, the body having lost all traces of segmentation and appendages though the tube like external egg sacs still indicate their real affinity.

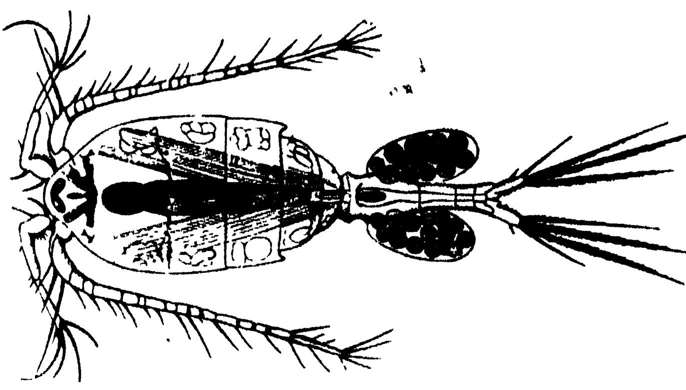


FIG. 54.—A female Copepod (*Cyclops*) with egg-sacs. (From Claus.)

Order 4.—Cirripedia.

This order is represented by the Barnacles and some very degenerate parasites. The young of the Barnacle is at first a free swimming nauplius. At a later stage it settles down on some object and becomes attached to it by its antennules. A fold from the head region is then developed and surrounds the whole animal. In the ship's barnacle (LEPAS, Fig. 55, B), this fold is strengthened by calcareous plates and in BALANUS (Fig. 55, A) the common acorn-barnacle, which may be found encrusting the rocks, seaweeds, etc., in the sea, the whole animal is surrounded by a ring of hard shell. They live by sweeping the food, consisting of minute animals, to the mouth by means of the thoracic limbs. The body is imperfectly segmented.

Sub-class II.—Malacostraca, or Higher Crustacea.

This includes the larger and more highly organised Crustacea. The number of segments of the body is definite, the head consisting of five, the thorax of eight and the abdomen of seven (except in one order). There is a gastric mill. A nauplius stage occurs in development, but it is passed in the egg, the free larva when present being more highly organized.

Order 1.—Leptostraca.

This order is of interest as being intermediate between Entomostraca and Malacostraca. There is a bivalve shell, not fused with the thorax as in the Malacostraca. The head is free from the thorax, the segments of

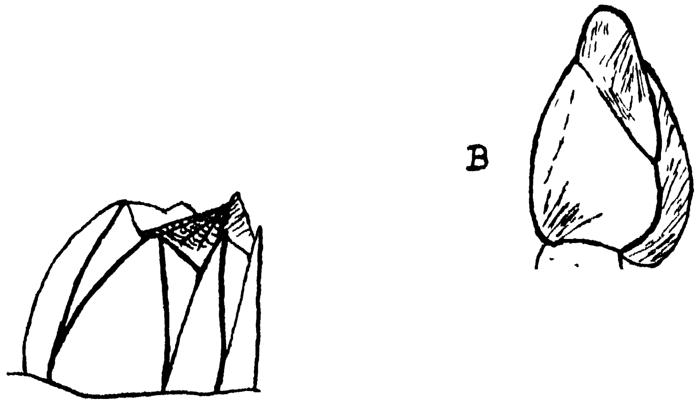


Fig. 55.—Barnacles. A, Acorn Barnacle, *Balanus*. B, Ship's Barnacle. *Lepas* (after Darwin).

which are also free from each other. They differ from the other Malacostraca in that the abdominal segments are seven in number. NEBALIA (Fig. 56) is the principal genus.

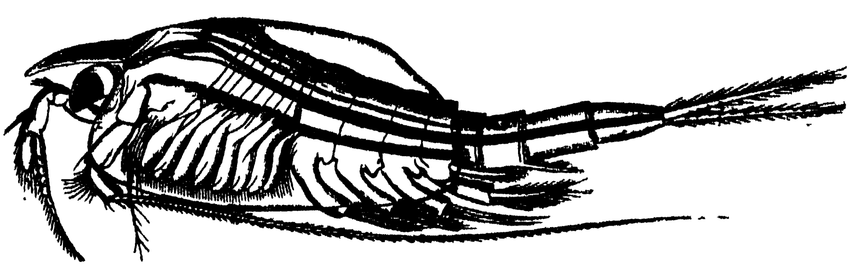


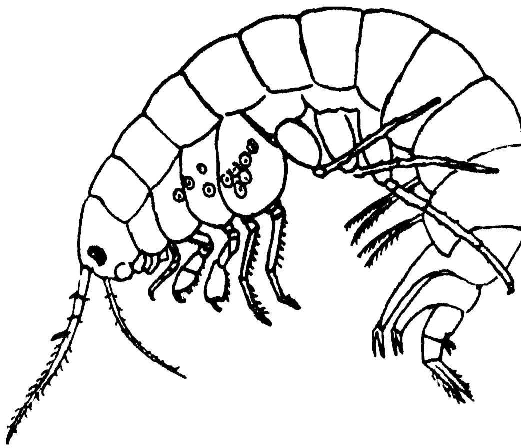
Figure 56.—*Nebalia* (from Claus).

Order 2.—Arthrostraca.

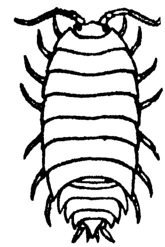
There is usually no carapace, and the first thoracic segment (and sometimes the second) is fused to the head, the others being free. This order is represented mostly by small forms, and is divided into two sub-orders. In the sub-order of the AMPHIPODA the body is mostly flattened from side to side and with gills on the thoracic appendages, as for instance in GAMMARUS (Fig. 57, A), the fresh water shrimp, or Orchestia, the Sand-hopper. A second sub-order, the ISOPODA, has the body flattened from above downwards with gills on the abdominal appendages. Familiar examples are the marine forms such as the "fish-louse" (MEINERTIA IMBRICATA) found in the mouths of fishes; the "wood-louse" (ONISCUS, Fig 57, B), a crustacean which is able to breathe air and is provided with tracheae like insects; the "gribble" (LIMNORIA LIGNORUM) a small crustacean very destructive to wood-work found in most countries, including South Africa.

Order 3.—Thoracostraca.

These are the largest and most familiar forms of Crustacea. In them the carapace has become fused with the thoracic segments. The eyes are mostly stalked. The first sub-order of the Thoracostraca are small shrimp-like crustaceans (Schizopoda), having the thorax more or less covered by a



A.



B.

Fig 57. - A. an Amphipod, the fresh-water shrimp *Gammarus*. B, an Isopod, the wood-louse, *Oniscus*.

carapace and the thoracic limbs of the primitive biramous type, *e.g.*, MYSIS. A second sub-order is the Decapoda includes long-tailed forms (MACRURA) such as the crawfish, shrimps, prawns (Fig. 58), hermit crabs, etc., and short tailed forms (BRACHYURA) or ordinary crabs, such as the common fresh water crab in South Africa (TELPHUSA PERLATA) and many sea crabs.

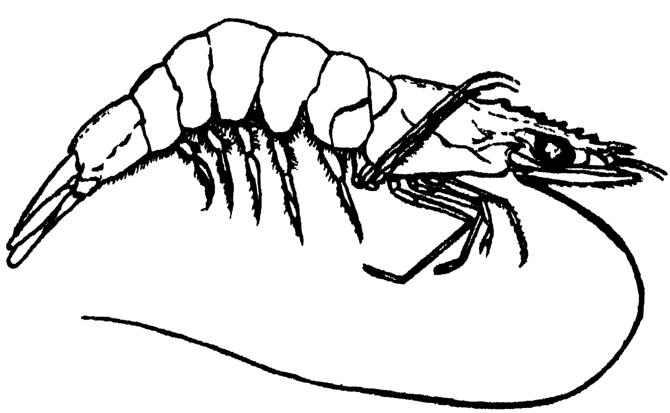


Figure 58.—The South African Blue Prawn, *Penaeus caeruleus* (from Stebbing)

The Brachyura have the tail much reduced and folded under the thorax; they have a characteristic larva known as a Zoaea (Fig. 51, B). Other sub-orders are the Stomatopoda (*e.g.*, Squilla), and the Cumacea (*e.g.*, Cuma or Diastylis).

Classification of Crustacea.

CLASS CRUSTACEA

Sub-class I. Entomostraca.

Order 1. Phyllopoda, *e.g.*, Apus, Streptocephalus, Estheria, Daphnia.
Order 2. Ostracoda, *e.g.*, Megalocypris, Crossophorus.
Order 3. Copepoda, *e.g.*, Cyclops.
Order 4. Cirripedia, *e.g.*, Lepas, Balanus.

Sub-class II. Malacostraca

Order 1. Leptostraca, *e.g.*, Nebalia.
Order 2. Arthrostraca, *e.g.*, Gammarus, Oniscus.
Order 3. Thoracostraca.

Sub-order 1. Schizopoda, *e.g.* Mysis.
Sub order 2. Decapoda.

Division 1. Macrura, *e.g.* Palinnus.
Division 2. Brachyura, *e.g.* Telphusa.

Sub-order 3. Stomatopoda, *e.g.* Squilla.
Sub-order 4. Cumacea, *e.g.*, Cuma.

Class II.—Prototracheata.

This is the most primitive class of the air breathing Arthropods; it is indeed more simple in some respects than any known Arthropod, even among the Crustacea, being one of those links or primitive animals which have remained comparatively unchanged while other allied groups have been undergoing great modifications, as a consequence may be of a more active mode of life. Such survivals, or living fossils as they have been called, occurs in other groups, and they are characterised amongst other things by their wide and discontinuous distribution on the earth's surface. Thus the form representing this group, PERIPATUS (Fig. 59), is found in the West Indies, Australasia, and we are fortunate in having it well represented in South Africa.

Peripatus is common in the Cape Peninsula, and may be found in damp places under stones, the bark of trees, etc. It has been compared in general appearance to a centipede or caterpillar, or a short thick worm. It has a beautiful velvety colour, and is possessed of numerous legs (about 17-24 in

Fig. 59.—*Peripatus capensis*, slightly magnified (from Sedgwick)

Cape species). Unlike the Crustacea and like the next two classes it has only one pair of antennae. The mouth has toothed jaws (modified appendages) and a third pair of appendages is represented by two small oral papillae from which a sticky substance can be ejected when the animal is irritated, and probably this is of use not only for defence purposes but for catching minute spiders and other animals on which it feeds. Development shows that the glands which secretes the fluid, are modified renal organs or nephridia. The appendages following this are short stumpy walking legs, provided with claws, and having each a nephridium at their bases. These nephridia ends internally in a vesicle which is all that remains of the body cavity so fully developed in the Earthworm. We have

seen that the body cavity is reduced to a single pair of renal organs in the Crustacea and we shall see that it does not occur at all in the Myriapods and Insects, so that in this respect Peripatus resembles Annelida rather than the Arthropoda. The fact also that the two ventral nerve chords are widely separate and that there are cilia in the generative tracts, the appendages hollow, the pharynx muscular, etc., separate it from the Arthropoda and indicate an affinity with the Annelida. On the whole it is to be placed in the arthropod group as it has jaws, a heart like Arthropods, and no coelom surrounding intestine. Amongst Arthropods it is to be placed near Centipedes and Insects, as like them it has one pair of antennae and their peculiar breathing organs (tracheae) It differs from them in having a single pair of appendages modified as masticatory organs, the absence of a thick cuticle, and the more unmodified nature of the segments and appendages behind the head

Class III.—Myriapoda.

This class like the previous is a comparatively small one, and includes the Centipedes and Millipedes. These, like Peripatus, are worm like animals with many segments and provided with tracheae and numerous feet, but with no segmentally arranged nephridia They have many points in common with the insects. Thus the head is distinct, and bears a pair of jointed antennae mandibles and maxillae. The body is not, however, differentiated into regions as in the insects, and behind the head it consists of a large number of similar segments with simple leg-like appendages

The Centipedes and Millipedes (Fig. 60), are well represented in South Africa, and some of them are too well known to farmers and gardeners as the destructive "wire-worm"

There are two chief orders

Order 1 —Chilopoda or Centipedes.

These are represented in South Africa by various species of Scolopendra Lithobius, etc. In this order is to be placed also a peculiar spider-like form (SCUTIGERA, Fig. 60, C), which is found on the walls of dwelling-houses and often causes unnecessary alarm, as there is no evidence that its bite is harmful to man. It has however poison glands with which it kills the insects and small animals on which it feeds. A centipede with the last pair of legs curiously flattened is found in Natal (Encorybas natalensis).

In this order the body is rather flattened and on the head region are antennae mandibles and two pairs of maxillae. A pair of feet is transformed into poison organs (maxillipedes); these are the first pair of appendages of the body, though they are bent forward and lie under the head. They each have a small aperture at the tips by which poison can be ejected into their prey. The many appendages behind these are jointed walking legs. There are no nephridia and the excretory function is performed by entirely different organs,—long tubes which lie in the body and open near the hind end of the alimentary canal called **Malpighian tubules** In this order there is a single genital aperture in the second last segment.

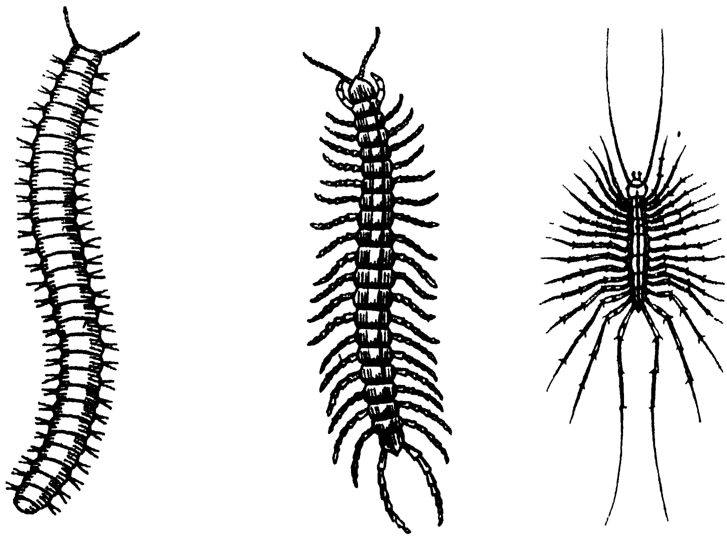
The Centipedes are carnivorous as we might expect from their poison jaws, and although therefore dangerous enemies of insects, caterpillars, etc., may be regarded for this very reason as beneficial to man.

Order 2. —Diplopoda or Millipedes.

These have no poison jaws like the Centipedes; they have antennae, broad mandible and only one pair of maxillae. Their mouth parts are therefore adapted for a vegetable diet. Some of them are known as "wire

worms" though they are not worms like segmented-worms or round-worms (one of which is sometimes called a wire-worm) nor are they larvae of any insect though the larvae of a beetle (Click-beetle) sometimes go under the same popular name.

They may be easily distinguished from the Centipedes by their rounded body and by there being apparently two legs to each segment, an appearance brought about by the fusion of the segments in pairs. (Fig 60, A.) The genital apertures are two and occur in the third and fourth segments.



B. C.

Figure 60.—Myriapods. A, a Millipede. B, a Centipede (from Thomson's Zoology). C, a Centipede, *Scutigera*.

A larger millipede, Spirostreptus, is very common in South Africa, but it does not appear to damage vegetation but the same cannot be said of others and smaller forms which damage tuberous plants and seedlings. Potatoes are sometimes laid down to draw off the pest

Class IV. -- Insecta or Insects.

We have seen in aquatic Arthropods (Crustacea) that in the higher forms there is a tendency to reduction in the number of segments and appendages and specialization into definite regions of the body and we find the same in air-breathing forms. Thus in the Insects we find that the body has fewer segments and appendages than in Peripatus and Myriapods and that they are specialized into *three well defined regions—head, thorax, and abdomen.* Again the appendages consist only of a pair of antennae, mandible, two pairs of maxillae, and *three pairs of thoracic legs* attached to the three segments of this region, the abdomen having no appendages except in some cases where two rod-like structures, the anal cerci, are present. A pair of wings is usually present on each of the last two of the three thoracic segments. These may, however, be much reduced or disappear, and in one small group never seem to have been present.

An outstanding feature in the mode of life of the insect is its power of flight and this has had a marked relation to its bodily structure. Part of its life is usually spent as a grub or caterpillar in the varied

surroundings met with in a life on the ground or in water, and part in the more uniform environment of aerial life. This combination of variety and uniformity seems to be reflected in the general class of the Insecta. There are no greater number of species in any other group of the animal kingdom and there is at the same time a wonderful similarity in their diverse forms

The combination of this varied and at the same time uniform mode of existence has been a most successful one, and insects are to be found in most conditions which will support animal life, at least on land. This will be apparent from the mention only of a few representatives such as locusts, house-flies, mosquitoes, butterflies, beetles, bees. They come in close relationship also with the life of other animals, and they are one of the most important features to be reckoned with in the work of the agriculturist.

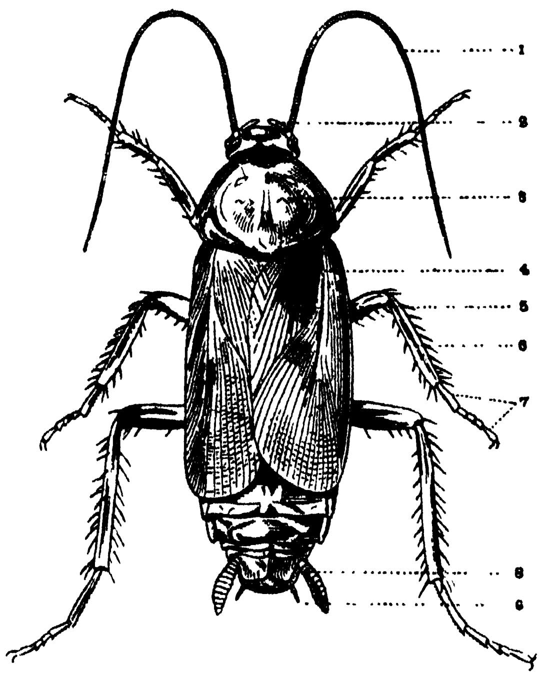


Fig. 61.—The Cockroach, *Periplaneta orientalis*, male, magnified two times ; 1, antennæ ; 2, palp of first maxilla ; 3, prothorax ; 4, anterior wings ; 5, femur of second leg , 6, tibia ; 7, tarsus ; 8, anal cerci ; 9, anal styles. (Kukenthal.)

PERIPLANETA AMERICANA OF P ORIENTALIS, the common Cockroach (Fig. 61), is a convenient type to illustrate in more detail the structure of insects. The Locust may also be examined, as it differs from this type only in a few particulars to be noted afterwards

External characters.—The body is covered by a hard cuticle and three distinct regions may be made out. The first is the hard rounded *head* which does not show any external traces of division and bears on its upper and outer edge a pair of large eyes and is joined on to the thorax by a rather thin neck. The second or *thorax* is seen to be made up of three segments which are called the prothorax, the meso-thorax, and the meta-thorax. Each of the segments consists of a dorsal part or tergum, a ventral part or sternum and these are united at the sides by a pleural membrane. On the terga of the meso- and meta-thorax there

are two pairs of wings, the front pair (elytra) are hard and horny and cover over the hind pair which are more delicate, being the chief organs of flight, though the cockroach does not often fly. Between the segments of the thorax may be seen the apertures (stigmata) which lead into the organs of respiration. The third region of the body is the *abdomen* which may be seen to be composed of ten segments. The eighth and ninth are not so readily made out as they are overlapped by the seventh, but they may be seen if the abdomen is stretched out. The segments of the abdomen also have terga and sterna and on the pleural membrane connecting these there are stigmata.

The *appendages of the head* consist of (1) a pair of long jointed *antennae* or feelers which are sensory organs, (2) a pair of *mandibles* (Fig. 62, I) which are hard biting organs like those of the crawfish but with no palp (endopodite). (3) The *first maxillae* provided with a two-jointed protopodite (cardo and stipes) an endopodite of two parts (an outer soft galea and an inner hard lacinia) and an exopodite or maxillary palp of five joints. (4) The *second maxillae* are of the same general arrangement but have the two joints of the protopodites of each side fused with each other in the middle line so as to form two median parts called the mentum

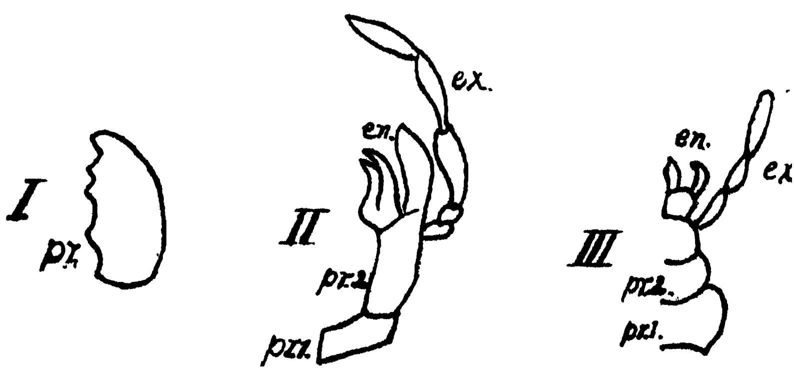


Fig. 62.—Appendages of Cockroach · I., mandible; II., first maxilla; III., second maxilla; *pr.*, protopodite; *en.*, endopodite; *ex.*, exopodite.

and sub-mentum, which thus form a sort of lower lip or labium. The endopodite as in the case of the first maxillae is divided into two (an outer paraglossa and an inner ligula) and the exopodite is represented by a jointed palp, called the labial palp.

In addition to this organ round the mouth there is also a median upper lip or labium which, however, is not a typical appendage nor part of an appendage like the lower lip.

The *appendages of the thorax* are three pairs of walking or running legs attached to the sterna of the three thoracic segments. Insects are often called six-legged animals or Hexapoda. Each leg has five divisions—coxa, trochanter, femur, tibia, tarsus of six short joints with terminal claws. (Fig. 61.)

The *appendages of the abdomen* are mostly absent and are never in the form of walking legs as in other Arthropods. There is a pair of small projections or anal cerci (Fig. 61, 8) below the tenth segment and these seem to represent transformed appendages, and are present in both sexes; there is also in the male a pair of anal styles (Fig. 61, 9) in the ninth segment, but it is doubtful if these correspond to appendages.

Alimentary System.—As in the Crustacea a large part of the digestive tract is lined by ectoderm. The mouth opens into a buccal cavity which has salivary glands (Fig. 63). There is a chitinous fold on the floor of the

mouth, the lingua or tongue. The oesophagus is followed by a large crop in which food may be stored up. Then comes a gizzard with hard chitinous walls, all up to the point being ectodermal. The only endodermal part is that which follows, the chylific ventricle, which is provided with glands and gives off eight tubular hepatic diverticula. Where this section joins the succeeding (the intestine) there are given off a number of Malpighian tubules which act as *renal organs*. This intestine, which is long and coiled, ends in an enlarged part called the rectum. Only the chylific ventricle and its divecticula which constitute a relatively small part of the whole alimentary tract are endodermal or form a mesenteron.

Vascular system.—The heart (Fig. 63), is a long vessel divided into chambers and opening into the pericardium by valves as in the Crawfish, and part of the blood system is a haemocoel as in that type.

Respiratory system.—The organs of respiration are fine tubes or tracheae which open to the exterior by the stigmata. They are lined by hard chitin, which takes the form of a spiral, so that they do not readily collapse. Their fine branches penetrate all the organs of the body, and oxygen is thus conveyed to the tissues directly, and not by means of the blood as in Crustacea and higher animals. The air is expelled and taken into the tracheae by movement of the body

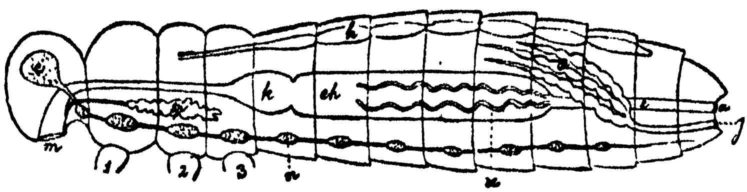


Figure 63.—Diagram showing chief internal organs of an insect. 1-3, legs cut off; *a*, anus; *c*, cerebral ganglion or brain; *ch*, chylific ventricle or mesenteron. *e*, intestine; *g*, genital aperture; *h*, heart; *k*, crop and gizzard; *m*, mouth; *n*, nerve ganglion; *sp*, salivary gland; *u*, Malpighian tubule; *o*, ovary. (Text Book of Zoology, Boas)

(To be continued.)

ANIMAL DISEASES—CONTAGIOUS AND INFECTIOUS.

Summary of Outbreaks of Contagious and Infectious Animal Diseases Scheduled under Act No. 27 of 1893.

Still under Quarantine on 31st October, 1909.

DISTRICT.	Anthrax.	Epizootic Lymphangitis.	Lungsickness.	Redwater.	Scabies (Equines.)	Sponsziekte.	Tuberculosis.	Glanders.	Totals.
Alexandria ...	1	...	...	...	...	2	...	...	3
Barkly West	..	...	1	...	...	...	...	...	1
Calvinia	...	...	...	...	...	...	...	1	1
Cape	...	...	...	...	...	...	2	...	2
East London	1	...	3	...	...	3	...	...	7
Hay	...	...	1	...	...	...	...	...	1
Herschel	1	...	...	...	...	...	...	...	1
Humansdorp	...	2	...	...	4	...	...	...	6
Kimberley ...	2	...	...	...	...	...	...	...	2
King William's Town	1	...	9	1	...	5	...	...	16
Komgha	...	...	...	...	1	1	...	...	2
Kuruman	...	...	...	...	...	1	...	...	1
Mafeking	...	...	...	...	...	3	...	...	3
Peddie	...	...	1	...	...	...	...	...	1
Port Elizabeth	...	...	...	...	1	...	...	...	1
Queenstown	1	...	...	...	...	...	...	...	1
Willowmore	...	...	...	...	1	...	...	...	1
Tembuland.									
Umtata	...	...	7	...	...	...	...	...	7
Engcobo	...	...	14	...	...	...	...	...	14
St. Mark's ...	...	...	1	...	...	...	...	...	1
Mqanduli	...	...	4	...	...	5	...	...	9
Elliotdale	...	...	6	...	...	2	...	...	8
Transkei.									
Butterworth	1	...	8	...	...	2	...	...	11
Kentani	...	...	4	...	...	8	...	...	12
Nqamakwe ...	1	...	5	...	...	1	...	...	7
Tsomo	...	...	3	2	...	...	...	...	5
Idutywa	...	...	7	...	...	...	...	...	7
Willowvale	...	...	11	...	...	6	...	...	17
Pondoland.									
Libode	...	...	1	...	...	...	...	...	1
Ngqeleni	...	...	4	...	...	...	...	...	4
Lusikisiki ...	...	...	4	...	...	...	...	...	4
Bizana	...	...	...	...	...	3	...	...	3
Tabankulu	...	...	13	...	1	...	...	...	14
East Griqualand.									
Mount Ayliff	...	...	1	...	...	1	...	...	2
Umzimkulu	1	...	...	...	...	1	...	...	2
Qumbu	...	...	5	...	...	...	...	...	5
Tsolo	...	...	9	...	...	...	...	...	9
Mount Frere	...	...	2	...	...	...	...	...	2
Mount Fletcher ...	...	...	...	...	...	1	...	...	1
Totals ...	10	2	124	3	8	45	2	1	195

(Sgd.) J. D. BORTHWICK, Chief Veterinary Surgeon.

Office of the Chief Veterinary Surgeon,
Cape Town, 3rd December, 1909.

BECHUANALAND FROM THE IRRIGATION STANDPOINT.

A RECONNAISSANCE SURVEY

By F. E. KANTHACK, A.M.I.C.E., Director of Irrigation

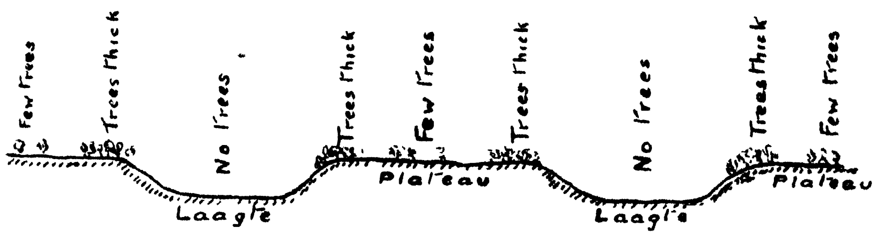
(*Continued from page 550*)

(74). *Block between the Mosita and Thlakgaming Rivers.*—I passed through this block by way of the farms Faith, Nooitgedacht, Witgatboom, Leeuw Draai, Witteklip, Kommandant Spruit, Goede Hoop, Doorn Spruit and Richmond

The farms Faith, Hope, Nooitgedacht and Witgatboom are on the granite and the road runs through thickly wooded country. The Tglapping spruit runs through the Western portion of Witgatboom and joins the Molopo below Daly's Pan. There is an outcrop of granite here and a dam 250 yards long and 16 feet high in the centre was built across the laagte. It was made in 1891 and is said not to leak. Leading is done from 6 inch pipes, one at each end of the dam The storage is small. Lands consist of black vlei soil of which a width of 400 feet is irrigable but cultivation extends over a width of 1,000 feet. Mealies and Kaffir Corn are chiefly sown. "Witgatboom" was the only occupied farm I struck on this long trek and is one of the very few in the whole block, which is otherwise practically waterless The laagtes which are crossed are very wide, sometimes over 2 miles, shallow and consisting of vlei soil and tufa. The higher country is dead level, very sandy and with few exceptions treeless owing to grass fires. During this trek the oxen were without water for nearly fifty hours, the wells and cuttings in the calcareous tufa on the farm Goede Hoop in the laagte being quite dry, though good rain had fallen a few weeks previously. Until water boring operations are undertaken systematically on these farms and the veld is protected from fires there is little hope for improvement. With the exception of koorhaan and some baboons I saw no signs of larger animal life. The veld shows unmistakable signs of having been very badly treated by burning. In parts the lime is very near the surface, and the veld consequently poor.

(75). *The Thlagamming* valley is a great improvement on the laagtes in the block just referred to. This laagte is a very shallow depression with no definite channel. The bottom consists as usual of black vlei soil overlaying calcareous tufa under which again is the rotten granite. The sides of the laagte consist of deep sandy soil. There are no trees in the laagte, few on the adjoining plateau, and thick tree growth along the

margins. Trekking across these laagtes I always noticed these same conditions shown diagramatically below The valley has been badly burnt



out, but I noticed that where the veld had been protected from fire for a little while there was very considerable growth of young trees and, given moderate protection from fire, most of this Bechuanaland denuded veld would very quickly become reafforested. The tributaries forming the Thlakgamming laagte start just South of the Ganesa Native Reserve, and form one valley at the Thlakgamming location. It then runs through the First Railway Grant block of new farms, along its Eastern margin, and adjoining the Mafeking District It is joined on this block by two tributary laagtes, the upper one running through the new farms Goodwood, Moorfield, Cumnor, and the lower one through Palmyra and the Madeakham Reserve.

(76).—The main laagte runs through the farms Stonehenge, Distin, Beaulieu, Richmond and Blackheath In this part of the country there are few farms equal to these.

As explained elsewhere, before offering these new farms for selection, Government put down boreholes on each of them, and the results of these operations are given in the table attached to para. 21 supra. It has already been shown how the underground water supply seems to diminish towards the Ganesa laagte The farms demarcated in the block are each from 4,000 to 7,000 morgen in extent, and these areas are held to be much too large by all who know the country well This fact accounts for the very disappointing way in which application was made for them. As farms in this country must be divided in such a manner as to give to each a portion of laagteland, their width necessarily becomes very considerable, and if farms of 2,000 morgen are to be demarcated they will be generally of very short length measured along the laagte as compared with this width. The manner in which they could be subdivided must, however, depend entirely upon the position of successful boreholes or wells, as a farm, especially a small one, without water or without reasonable expectations of finding any, is useless. The action of the Government in boring for water on these new farms prior to their being thrown open for selection was a very sound one, even if they were larger than desirable. Considering that the Government drilling operations have indicated pretty clearly where boring may be expected to be attended with success, I am very much surprised that their size should have deterred applicants, as the purchase price, and the terms of purchase were the easiest imaginable.

I struck the Thlakgamming laagte on the farm Richmond. Rain had fallen three weeks previously after months of dry weather yet I found numbers of pools of water of considerable depth and size.

(77). —The high land between Richmond and Blackheath and Madeakham consists of very fertile soil of a rich red colour and thickly covered with trees The Madeakham laagte above its junction with the Thlakgamming on Chwabe cuts across a corner of the big farm Reitadale. Mr. Flemmer is working this farm and deserves great credit for some

valuable experimental work here. He had sown two acres of lucerne close to the homestead, some distance to the west of the lowest portion of the laagte on the red sandy soil, and away from the black vlei soil which occupies the valley bottom. This area had previously been sown with water melons and had received no special treatment. In February, 1907, immediately after rain, Mr. Flemmer sowed 22 lbs. of lucerne on the 2 acres. The season was favourable and the lucerne stooled splendidly, and though it had been sown too thinly, presented an excellent appearance being in full bloom when I saw it. Mr. Flemmer was growing it for seed. The almost complete absence of weeds was very noticeable. At this place there is five feet of good soil above the lime tufa which, further down the laagte, is much in evidence on the surface. Mr. Flemmer was busily engaged ploughing up 50 morgen of similar land on which he wishes to establish lucerne and if worked properly on sound dry farming principles success should be assured. The lucerne is to be used here in connection with ostrich farming. Near the homestead is a well 90 feet deep through red sand, calcareous tufa, and rotten granite. At 70 feet a band of sand and boulders was met with, followed again by rotten granite The whole work was done by pick and shovel only. This well is worked by a Bakkies Pump with two donkeys. The total lift is 94 feet, and working for 14 days, it gave an average yield of 16,000 gallons per diem. Half the buckets have been removed, and the animals did not appear to be very hard worked, but the strain on the gear is very great. Mr. Flemmer informed me of another bakkies pump in the neighbourhood working to a depth of 96 feet.

(78).—The next farm below is "Chwabe," belonging to Messrs. Davies and Bertram and is 6,000 morgen in extent. In the laagte the lime tufa is very much in evidence and the veld is not so good as it is higher up. A well has been sunk 114 feet deep through lime and rotten granite and is worked by a 10′ Lloyds windmill which pumps it dry in half a day.

Below Chwabe the laagte is narrow and tortuous and comparatively deep. Soil is light in colour and lime is exposed in low places. In the centre there is a covering of black vlei soil. There are no trees in the laagte.

(79).—On the farm *Inverness*, which is deserted, a low dam, 5 feet high and 150 feet long at crest, has been built across the laagte, but the sub-soil leakage is so great that it is practically useless. Had the dam been made here on the surface of the ground, which consists of hard pan, and no excavation been made in the reservoir bed, it might possibly have been made watertight. The hard pan was, however, removed to get material for the dam with fatal results. A well 128 feet deep has been dug immediately below the dam, and it is said that when the reservoir is filling with storm water, the leakage can be heard running into the well.

(80).—In portions of this valley the bottom consists of a thin layer of hard pan or loam which overlies the porous material beneath, and where advantage is taken of this material to build small storage dams, great care must be taken not to touch it within the bed of the reservoir.

The character of the laagte is maintained to its junction with the Ganesa valley on Venters Rust. Surface lime, which is of considerable depth, predominating. A well sunk in the laagte near the homestead was dry.

The homestead is some 300 yards west of the laagte and is deserted. A well has been sunk there to a depth of about 120 feet through schist highly colured with mineral matter, probably copper. I understand that water obtained from this well was bad.

Dolomite zone near Morokwen

(81). –At this farm I left the laagte and trekked north-west to Kokoming. North of Venters Rust the dolomite zone is entered but only in a few places are there exposures of this rock; the zone is, however, different in character to the granite area It is almost entirely devoid of regular drainage lines their place being taken by pans. The surface is covered with deep sandy soil of light colour and is thickly covered with trees, more especially near the pans and "aars,' which are very numerous. At Kokoming, Padda Pan, Ferris, Mositlani, Double Aar, Kolokolani, I saw numerous pans, some of large size and all surrounded by dense forest growth At Mositlani alone I saw the dolomite rock exposed and there is a strong spring in the centre of this pan Aars are as numerous as pans, and on Kolokolani they occurred every few hundred yards running from East to West and generally 20 feet high Soil is rich and deep as can be seen by the numerous antbear burrows. The whole of this country is favourable for obtaining water by boring or sinking and surface conditions leave little to be desired. I saw more game here than at any other part of my tour but still the farms are all unoccupied On crossing into the Morokwen Reserve the scene immediatly changes.

From Kolokolani the country drops to the south towards Morokwen. The Reserve has been burnt out in many places and the trees give place to Haakdoorn scrub. The Morokwen Pan is a very large one, measuring about ½ mile in length by 1,000 feet north to south, and consists of calcareous clayey material. The pan lies about 150 feet lower than the general level of the country immediately north of the reserve

The country north west of Morokwen is waterless and deserted. At the time of my visit a police patrol had endeavoured to get across to the Molopo, west of Morokwen, but were turned back 30 miles north-west of "Campden" for want of water. There is water on Campden and a house on "Egham," but both farms are deserted. There is much game in this tract, however, gemsbok, haartebeeste, wildebeeste, Cape tigers and wild dogs abounding.

The Ganesa Valley.

This laagte resembles the Thlakgaming in outward appearance but much inferior to it as regards underground water. Close to the Native stad a dam 700′ long and 5 to 10′ high has been made across the laagte. Like parts of the Thlakgaming it is covered with a thin layer of loamy soil below which is the usual porous lime tufa and rotten granite. Material to built the dam was taken from the reservoir bed, with the result that the only tolerably watertight material having been removed from the bed, the reservoir will not hold water at all and is useless.

On the farm "Request" Mr. St. Quintin sank eight wells before getting water. He has now two wells on a reef of decomposed dolerite about 60 feet deep. There is also a dam across the laagte on a local bed of pot clay which lies 12″ below the surface soil. This layer of potclay was found to be over 18′ deep in one place but is a local peculiarity. The dolerite reef crossing the river is isolated, granite being found a little distance on either side. Mr. St. Quintin informed me that in a normal year two good crops of potatoes can be raised without irrigation here. The first crop should be sown in August and the second in January. Lucerne will likewise do well.

On the farm Lancewood (Brown) and Woodrust (Van der Merwe) there are several small dams across the laagte and used for stock purposes. Unluckily there is no pot clay here. The laagte bed is very porous and storage is impossible. Mr. Van der Merwe informed me that after filling the soakage amounts to 6 inches in 12 hours.

(83).—At the "Wegdraai" there is a Government outspan and a Government well has been sunk here for the use of travellers. The well is in the lowest part of the laagte and is about 100 feet deep through lime and rotton granite. It is not always to be relied upon. The almost complete failure of the recent Government boring operations on the new farms adjoining the Genesa has been dealt with in para. 20 supra, and is very striking.

The Ganesa valley is here narrow and has more or less defined slopes. The vlei at the bottom is 300 to 500′ wide. The slopes generally consist of red sandy soil but at some points consist of fine conglomerate similar to that met with along the Molopo, Granite outcrops are also frequent and calcareous tufa is much in evidence.

(84).—The farms to the west of the Wegdraai are not good. The veld is very sandy and entirely denuded of trees and shrubs, and the chances of finding water remote. There are some good farms, however, between the new block and the Morokwen reserve. "Cotswold," "Brakpan" and most of "Pipani" are good. On the last two farms Mr. McKay, who is managing for the owner, is doing very fine work. An enormous area has been enclosed with vermin proof fencing and a wide fire belt is maintained round the farms to keep out grass fires.

All these farms were once thickly wooded but vast areas of forest have been destroyed by fire.

Six wells have been sunk by Mr. McKay as follows:—

Pipani:

(1) At homestead 135′ deep—sandstone.
(2) 100′ deep.
(3) 60′ deep.
(4) In Gatarachukuru laagte 340′ deep—coglom. and granite

The last well was a failure and yields very little water. On *Brakpan*:—

(5) 40′ deep.
(6) 50′ deep.

The soil is unusual. It is very dark in colour and seemed to me to be slightly brak but it is very fertile. Dry land lucerne had been tried with success and looked very healthy after a year's growth. Mr. McKay is about to extend lucerne cultivation His favourite crop is mealies which does particularly well. The south and western portions of Pipani are dry and sandy and devoid of trees. On crossing from the Morokwen Reserve to Cotswold I noticed that grass fires on the Reserve had burnt up all the fence poles on the Cotswold boundary. The dense belts of forest growth accidently left by the fires show what this country would be like if protected from this outrageous practice. The chief trees throughout this country are the following:—

Kameel doorn, Mimosa, White thorn, Haakdoorn, Yellow wood (all varieties of Acacia), Witgatboom, Vaalboom and Wacht-een-beetje. Haakdoorn occurs chiefly as a bush and is then known as "Morokwa."

Ganesa to Motiton.

(85).—The veld is of fair quality throughout, where not burnt too much. Some farms are completely burnt out and grass is coarse. On the farm Southey I found a clump of very old Kameel doorn trees of great girth. The laagtes crossed are shallow but very wide and lime much exposed at the surface. On Southey there is a well in the laagte 30 feet

deep entirely through calcareous tufa. The farms passed through, viz., Southey, Heriot, Summerfield, Netherway and Sheppards Gift, were almost denuded of trees, excepting for occasional scattered specimens of Kameel doorn, Yellow wood, Vaalbush and Mimosa scrub On Sheppards Gift and Netherway the ground is very undulating and trees are thicker in the depressions.

Glen Red, belonging to Mr. Cullman, a very enterprising cattle farmer, and worked by Mr Owen, is an interesting farm and lies in the Mashowing area There are three dams near the homestead One across small side laagte above the house to the north 500′ long and 12′ high. Another across main laagte 700′ long and about 12′ high. Neither of these holds water the valley being too porous. The third dam is also in the main laagte below the others and is merely a pit surrounded by its own spoil bank It is in fine granite soil and holds water well. The farm is geologically interesting. There are an outcrop of Kraaipan formation. granite, a dolerite reef and a quartz reef all close to the homestead.

The Mashowing.

The following notes were supplied by Mr. Burrows:—

On the farm "Tong Valley" there are strong and permanent springs, which constitute the principal headwaters of this river The water is being used to good advantage for irrigating lucerne lands. The stream here cascades over level benches of sandstone and presents an excellent opportunity for a diversion scheme by means of a masonry weir; which at some future time the owner, a progressive ostrich farmer, contemplates carrying out: he will then be enable to irrigate land on his adjoining farm "Boscobel."

The river then enters the Motiton Native Reserve where there are at present permanent pools, but no flowing stream.

Where the valley emerges from the Native Reserve and passes through farms, there was no water flowing at the time of his visit, nor had there been for many months; in some past seasons of good floods it is said that the river has had a permanent flow; but for the past seven years this has not been the case.

The river bottom here is composed of loose sand of varying depths, with granite below which crops out frequently. There are no wells on these farms except in the river bed, where water-logged sand is found.

There are many good rock sites in the Native Reserve and again on "Kelokeloe" and "Doxan" for dams. At "Garephoane" there is blue clay 10 feet below the sand, which would make a good foundation

Speaking generally, however, this river does not lend itself to schemes involving dams across its course.

The longitudinal fall, ascertained by aneroid readings, is small; the irrigable areas are highly placed above the river bed, involving service furrows of great length, which would perhaps require lining throughout their length.

In addition, creeping sand would most likely prove an obstacle to success.

Mr. Moorcroft of "Garaphoane" has with success blocked a small side kloof and he is fortunate in having excellent red soil on his farm, suitable both for dam making and for cultivation.

At his request Mr. Burrows examined, and gave levels in other side kloofs where he intends to construct small embankments.

It is by this method that small irrigation schemes may be made profitable along this section of the river. Mr. Moorcroft gave me a list of farms on the south bank of the Mashowing at present unoccupied and undeveloped, upon which a similar plan could with advantage be adopted.

They are "Grayfield," "Longhurst," "Rugby," "Laxey," "Ilsley," "Cork," and "Slough." In connection with this, it might be possible to construct a main weir to divert water to a series of storage dams constructed in side kloofs on the above farms. Here too one meets a difficulty; these farms are owned by the Transvaal Estate and Land Development Company, whose terms of sale are so prohibitive, that they are likely to remain unoccupied for some time to come.

(87).—At Motiton, near the Police Camp, on the London Missionary Society's property, there are several very strong springs which are led into dams from which some crude and wasteful irrigation is carried on by the natives who grow wheat and mealies. Much could be done by this water with proper management, but it is at present used to very little advantage. The Motiton Reserve is almost entirely burnt out and devoid of trees. South of the Mashowing, after passing through a narrow strip of rough country of the Black Reef formation, the dolomite country of the Kaap plateau is entered .

MOTITON TO KURUMAN.

(88)—*Kaap Plateau.*—On passing from the granite area into the dolomite area of the Kaap plateau, the character of the country changes. All trees and scrub disappear except at long intervals near pans, aars and clumps, where calcareous tufa is exposed at the surface. Elsewhere the country is flat and dreary and very sparsely covered with soil, dolomite showing up everywhere as described in general terms in paras 9, 10, and 11 supra Springs are numerous. At Kgatlagomo (Beadle) there are two good springs surrounded by thick bush from which irrigation is being effected. Hitherto farming and irrigation has been of a crude kind, but Mr. Beadle has lately taken charge of the farm himself, and is making many improvements. The main spring has been opened out, a rectangular pit 220′ by 30′ formed, and the water is led into a shallow dam whence it is led in furrows to the lands adjoining. Mealies, potatoes and onions were being irrigated The road to Kuruman leads through dreary, sandy, monotonous country throughout. Along some of the laagtes, more especially the Matlowing, there are good springs, and primitive irrigation is carried on by the natives in the Bothethaletsa Reserve. This with the Kuruman Reserve takes up nearly all that is worth having in this valley

(89)—The Kuruman District, with its headquarters at Kuruman, is perhaps the most difficult of access of any district in the Colony, and portions of desert country account for a considerable portion of its area. The part herein dealt with is that forming, broadly speaking, the valley of the Kuruman River.

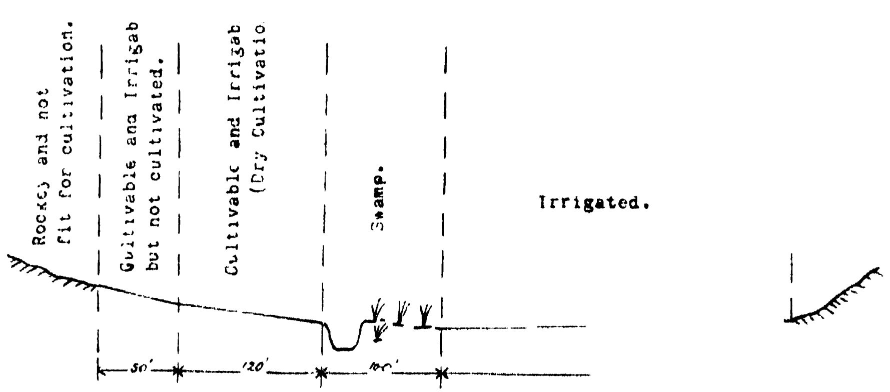
Approached from the North or North-East along the Motiton road, the ordinary characteristics of the dolomite veld of the Kaap plateau prevail to near the boundary of the Kuruman Crown Reserve. The plateau is here traversed by one of the "Aars" so typical of the Kaap plateau, but rather more pronounced in character. To the South-West of this ridge or "Aar" lies the Kuruman basin, extending some six miles across to the Kuruman range of hills The valley appears to consist of a series of benches, and is by no means as level as it looks from a distance. For the most part it consists of dolomite and chert, but as one approaches the Kuruman Range, which is composed of highly ferruginous rocks, the character of the ground begins to vary considerably. Along the South-West margin of the flat runs the valley proper of the Kuruman River. This valley is some 50 feet deep, and the land adjoining the river is sometimes flat, but generally undulating, and consisting of a mixture of ironstone gravel, dolomite, chert and red sand. The adjoining veld is not of the best, and is covered with low thorn and vaal bushes and occasional fertile patches covered with Kameeldoorn.

(90).—The Kuruman River issues from a cave in a limestone kranz, a detailed description of which is given by Mr. Rogers on pages 26 and 27 of the Annual Report of the Geological Commission for 1906.

The main valley of the Kuruman River, which extends in a more or less straight line running from North-East to South-West, was evidently formed under vastly different conditions from those now obtaining. The present bed of the Kuruman River is occupied mainly by the spring water issuing from the famous "Eye," and this stream is without doubt augmented by numerous other springs along its course. The river valley is, in general, very narrow. The central and lowest portion is a reed covered swamp which extends from the eye for about eight miles to within about 1½ miles of the boundary between the Crown Reserve and the Native Reserve.

The width of this swamp varies from about 100 feet to 1,500 feet, and in several places very large sheets of open water exist, notably at the upper end of the Mission property, and near the lower end of the Crown Reserve. Views of each of these places are shown.

(91).—From the "Eye" down to the end of the second mile the average width of the valley bottom is between 500 and 600 feet of which, in a few places, more than half is under cultivation. Down to the Mission Station of Seodin, which is about 3 miles below the Eye, the culturable land is bounded on either side by a road which, for the most part, runs on the rocky surface of the undulating ground forming the sides of the valley. A typical section of the valley above the Mission Station is as shown in the diagram.



(92).—The culturable portion of the valley bottom falls into three sections. A swamp in the middle, a very light black soil consisting almost entirely of organic matter, and margins of red sandy soil which grade into the rocky sides of the valley. The whole of the central portion occupied by swamp and black soil can be brought under cultivation when drained. In the second mile Mr. Johnston, who has some erven here, has done some very creditable reclamation work. He has diverted the central drain as far over to the left side of the valley as is possible, and confined it in an artificial canal for a length of 500 yards. He has thus managed to extend his cultivation two-thirds of the way across the valley. The conventional section given above was taken at the lower end of Mr. Johnston's erven.

Mealies do well in the newly reclaimed swamp soil, but for successful agricultural operations it is necessary to ride on a good deal of the red sandy soil from the margins.

Below Mr. Johnston's erven the big Seodin swamp begins. At the upper end is a rough dam made of sods above which the two Mission furrows take out—one on the right and one on the left.

(93).—The Mission property, known as Seodin, belongs to the London Missionary Society, and was established by the Rev. Mr. Moffat in 1826. The area of this property is 535 acres, and includes a number of buildings, of which the group forming the Moffat Institute, built on an eminence on the right side of the river, are the most important, and form a striking landmark for many miles round. The Seodin Mission Station is, considering its agricultural possibilities, in a distinctly backward state of development. The Moffat Institute, which was established as a Training Institution, has been abandoned for that purpose and is now put to no use. The buildings are said to have cost £12,000.

(94).—In 1903, Mr. C. D. H. Braine, A.M.Inst. C.E., of the Public Works Department, submitted a lengthy report on the possibilities of irrigation development along the Kuruman River within the Crown Reserve, and on the relation of the Mission property to a general scheme for development.

As stated above, the entire property contains 535 acres, and taking Mr. Braine's irrigation scheme as a basis, this land should be classified as follows:—

(1) High or Rocky ground	164	acres.
(2) Irrigated lands	96	,,
(3) Irrigable lands, partly above Mission canals, with Mission Station Roads, etc	163	,,
(4) Swamp	112	,,
	535	,,

Contained in items (2) and (3) are portions which are to be reserved by the London Missionary Society, but are, I believe, very small in extent.

(95).—There is no doubt that with enterprise, capital and co-operation, much can be done with reclaimed swamp land. Some of the irrigated Mission lands at Seodin showed marvellous fertility. Most of these lands are regularly double cropped, viz., wheat followed by mealies, good yields still being obtained after many years of cultivation without any manure having been given. Wheat, barley, oats, beans, mealies, tobacco, kaffir corn and fruit of many kinds all do excellently. The Mission garden represents a wonderful spectacle. Excellent fruit of every description, strawberries and vegetables of many kinds, all grow to perfection in a sadly overcrowded garden, and irrigated under conditions which have meant early death to many South African orchards. The Mission has been unable to reclaim the big Seodin swamp to any large extent and has confined it by a low embankment which gives much trouble by constant breaching. Most of the land is reclaimed and cultivated by natives, but the amount of individual effort required to reclaim further swamp lands is rather more than can be expected from the Kuruman native, Christian or otherwise. It is of little use attempting swamp reclamation on anything but a minute scale except by obtaining control of the water close to its source and leading it in canals away from the swampy areas.

(96).—The Natives practice a considerable amount of lift irrigation here which is generally unnecessary, as most of the land so irrigated is easily irrigated by flow. I noticed the same thing at the Native Village of Mecwetsaneng on the Matlowing valley (Motiton-Kuruman Road). The method of lifting water practised by the natives in the Kuruman district is the most primitive I have ever seen, being effected by hand with an ordinary bucket. Compared with this the numerous ancient Indian and Egyptian devices for effecting low lifts are highly efficient. A few white men have installed rough forms of chain pumps made of wood, the chain consisting of a canvas band on which wooden plugs are mounted. A few rough bakkies pumps are also installed. Most of these appliances are to

be found on the Government erven between the township and the Mission property. These are held on such temporary terms that erfholders will not commit themselves to any expenditure, on anything but the most temporary and often primitive, devices.

(97).—Below the Mission lands lie Mr. Chapman's erven, a large part of which has been reclaimed and turned into valuable lands. Mr. Chapman has forced the Kuruman stream far over to the right side of the valley and his lands run now most of the way across. I saw excellent crops of oats, wheat and barley, and also lucerne of a few months' growth which had established itself splendidly. This, I believe, is the first lucerne which has been grown at Kuruman and the crop itself had not received proper treatment when I saw it. It is evident, however, that lucerne will do excellently, provided that it is not grown in the lowest ground, and so likely to be waterlogged.

(98).—Below Seodin the valley narrows again, and there is but little cultivation existing, or possible, as far as the big swamp which lies at the lower end of the Crown Reserve. Below the swamp the valley again narrows, and thenceforth, through the Native Reserve its character changes. At Maropin it widens out, and there is a large area of fertile flat country with extensive irrigation. Cultivation and irrigation extends throughout the valley down to Tsinin at the junction of the Kuruman and Matlowing Rivers, and even beyond. I understand from Mr. Chapman that in the distance of 40 miles from the Kuruman spring to Tsinin, there is barely five miles without irrigation. All this irrigation is not dependent on the Kuruman fountain alone. There are numerous springs all the way down, and I think there is as much, if not more, water at Seodin as there is at the fountain.

The discharge at the fountain was stated by Mr. Edwards, of the Public Works Department, to be 3,000,000 gallons per 24 hours. Mr. Rodgers, Director of the Geological Commission, made some observations in September, 1906, and obtained a discharge of 5¼ million gallons per day. I took a discharge of the fountain water in October, 1907, and found it to be 4,104,000 gallons per 24 hours. Mr. Edward's estimate was made about nine years ago, and seeing that the observations by Mr. Rogers and myself were made after a prolonged shortage in rainfall, it is safe to think that the 3,000,000 hitherto assumed as the discharge of the fountain is low. Mr. Rodgers' result is, I consider, too high, as he based his calculations on surface velocities, whereas the mean velocity of the body of the water is considerably less. If the flow from the fountain is as steady as local people make it out to be, then, I think, 4 million gallons per 24 hours will not be far wrong.

(99).—The following information regarding stock farming and agricultural operations was obtained locally from reliable sources:—

STOCK: *Sheep*.—Persians do very well, and likewise Cape sheep. Merinos do not appear to thrive. Some farmers run Merinos together with Cape sheep, but under these conditions the Merinos do not do well, as they cannot get sufficient food.

Wire worm is prevalent, but not very bad, and capable of treatment. Sheep do better if a change of veld is occasionally given; about a month's change not less than 24 hours' journey from usual grazing. Scab was formerly very prevalent, but there appears to have been much improvement since the advent of the Scab Inspector.

Cattle.—With proper treatment large stock do well. Lamziekte is occasional but not really bad. Thus Mr. Chapman, who is a good farmer, has lost only two head of cattle out of 80 since the war. Some of Mr. Chapman's neighbours are not so fortunate. Thus the Rev. Mr. Brown, Missionary in Charge of the Seodin Station said he could not keep cattle

in the valley at all. There is no doubt that if suitable precautions are taken, and plenty of bone meal is given, losses from this source are small.

Horses.—Horse-sickness is very bad in the valley, and it appears that animals do not become "salted." During the bad season horses are sent up the mountains.

Agricultural Operations.—The crops which can be grown under irrigation at Kuruman include wheat, barley, oats, mealies, millets, tobacco, potatoes, fruit and vegetables.

Tobacco grows very well indeed, and is generally superior to that sold in the stores, which is brought from outside. Cereals, millets and potatoes all yield very heavy returns. Land is nearly all double cropped, the wheat or other cereals generally being cut in December, often in an unripe condition, to make way for mealies, which must be planted before the New Year. Though some bottom lands are still giving wonderful returns without any manure being put into them, double cropped land should have manure every second year.

Birds are very troublesome and have to be constantly scared. There is a very great variety of beautifully coloured finches which, however, all do mischief.

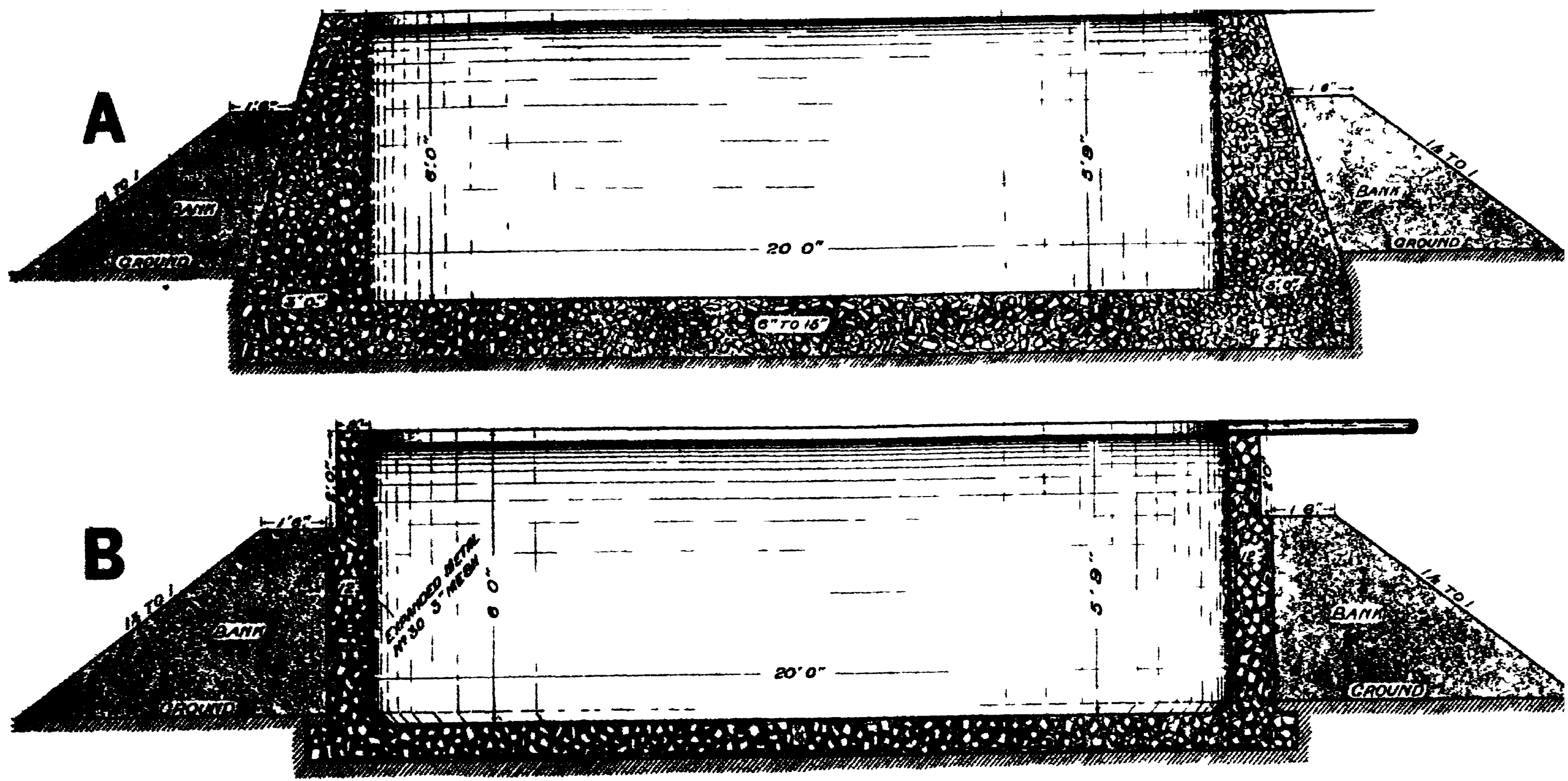
The following are the average prices obtaining at Kuruman, which are, however, very much exceeded in bad seasons:—

Wheat	30/- per bag of 200 lbs.
Beans	30/- per bag of 200 lbs.
Mealies	20/- to 40/- per bag of 200 lbs.
Kaffir Corn	20/- per bag of 200 lbs
Potatoes	15/- to 25/- per bag of 150 lbs.
Oathay	4/- per bundle of 5 lbs.

My local investigations went to corroborate the assertions made by Mr. Braine, Assistant Engineer, in his report on Kuruman, that an ample market exists for all produce likely to be grown with increased irrigation facilities.

(100).—We can now consider possibilities for the development of irrigation at Kuruman. From an engineering point of view this must be on the lines proposed by Mr. Braine, A.M.Inst.C.E., viz., by taking out two canals, one on each side of the valley, from above a small diversion weir placed across the river immediately below the "Eye." At the same time a deep drain must be excavated down the centre of the valley by means of which seepage water, and spring water, coming in below the "Eye," will be led away and the large area of swamp thus reclaimed for cultivation.

(101).—Mr. Braine proposed to run the furrows at a slope of 1 in 5,000, each being capable of carrying a discharge of 3 cubic feet per second. The gross area of irrigable land commanded from these canals has not been accurately determined. He assumed that with lined canals an area of 2,000 acres of good irrigable land could be found and irrigated. In his calculations Mr. Braine has been misled by the old arbitrary allowance of water fixed for the Douglas Canal. At Kuruman, if irrigation can be carried on continuously throughout the 24 hours, and for 300 days per annum with a discharge of 5 cubic feet per second delivered at the field boundaries, I consider that not more than 1,200 acres per annum could be irrigated, and I doubt very much if this amount of energy would ever be displayed there, hence it is of no use expecting to do more than 1,000 acres with canal water obtained from the "Eye" alone. As there is a considerable amount of additional spring water along the course of the river which would be augmented by a considerable amount of seepage water, it might be possible to irrigate a certain area of land in the valley bottom from a subsidiary weir some distance below the main weir at the



TY s OF WATER STOR E TANKS CAPACITY Round, 11 272 Imp ial gallon

A. Ordinary ass concr te **B.** Re-inforced concrete Re rred to n parag ll

"Eye." For the present, however, I do not think it advisable to base any conclusion on speculations of this kind and we may consider ourselves lucky if we see 1,000 acres irrigated from the Kuruman fountain. Working to this lower figure it will also be possible to cheapen the cost of the works, by running the canals at a somewhat lower level, and in easier ground.

Mr Braine's alignments run for very long distances in rock cutting which could, under a smaller scheme, be obviated Looking over Mr. Braine's estimates I consider that including surveys and supervision a thousand acres should be brought under irrigation for less than £2,000. Mr Braine has suggested lining the furrows at a cost of £9,500. It is true that absorption losses in unlined channels would be considerable, but there are less costly methods of reducing these losses, and any work of this nature should be done gradually in the course of maintenance.

(102) Taking for granted that 1,000 acres will come under irrigation, about 300 acres of this belongs to the Mission and to the Chapman family, leaving 700 acres on Crown Land Under the proposed irrigation scheme this land should be sold at from £5 to £10 per acre according to the amount of reclamation work which would be necessary and the Crown Land sold would therefore bring in some £5,000

(103)—A scheme of this kind is most desirable in the interests of the Kuruman District. At present the possibilities of the upper Kuruman valley are not only being thrown away, but are, moreover, in their existing uncontrolled state a source of danger from a hygienic point of view. It seems almost incredible that in a dry country such as Bechuanaland, the finest fountain in the whole Colony should be allowed to waste itself as it does at Kuruman.

Copies of analyses of soil samples taken in 1903 by Mr. Braine from spots marked are also attached for reference Vide Appendices D and E.

Kuruman to Vryburg

(104).—The following notes will convey a general idea of the country travelled over. The road leaves Kuruman at the fountain and for about five miles is metalled, but though the road itself is good, it is too narrow, and only portions are in use, the traffic passing alongside in most cases. The road passes through hilly country consisting mainly of dolomite, but there is a considerable surface covering of ferruginous fragmentary rocks derived from the Griquatown series. About 3 miles from Kuruman a small deep spruit is crossed with a strong flow of water. At Pakhane there is also a strong spring and the soil and veld are good and the bush is thick. After leaving the Pakhane kopje on the right the characteristic rank dolomite veld is reached.

(105).—On the farm Ganghae two laagtes are crossed and in both there is much calcareous tufa exposed. The first one was dry but the second one contained vlei soil in the middle and a small water hole.

On Magagapere there is a bigger laagte to which the second one on Ganghae mentioned above is a tributary. It had water flowing in it and there were relics of an orchard and cultivation but the veld is very poor and limy. The road is very rough and heavy until the spring on Tsaelengue is reached. Here the veld is a little sweeter, but tufa and dolomite are everywhere exposed, and the same character is maintained until the Matlowing is reached, near the Native stad Matlabanenong in the Bothethaletsa Reserve Good strong water was found flowing in the Matlowing here.

Beyond the Matlowing the soil is sandy, the country flat, and the veld better. On Gagatsaneng at the south-east corner there is a good spring and thick bush. Going east the road passes through Bushey Park.

The Mimosa bush becomes very dense and a steep escarpment is reached running west to east. This drop is very sudden and the country above and below it is very level. The fall is approximately 50 feet. This escarpment is the edge of the plateau at this point. The road keeps along the high ground through Mooifontein, Driehoek, Kalahari and Gumals Rust where it drops down below the escarpment All along the edge and for some distance away the mimosa bush is very dense and the springs and homesteads of Bushey Park, Bodiba Butala and Baily Brith are completely hidden.

(106) —On *Mooifontein* the veld is poor, and tufa and dolomite are everywhere in evidence The road is very bad

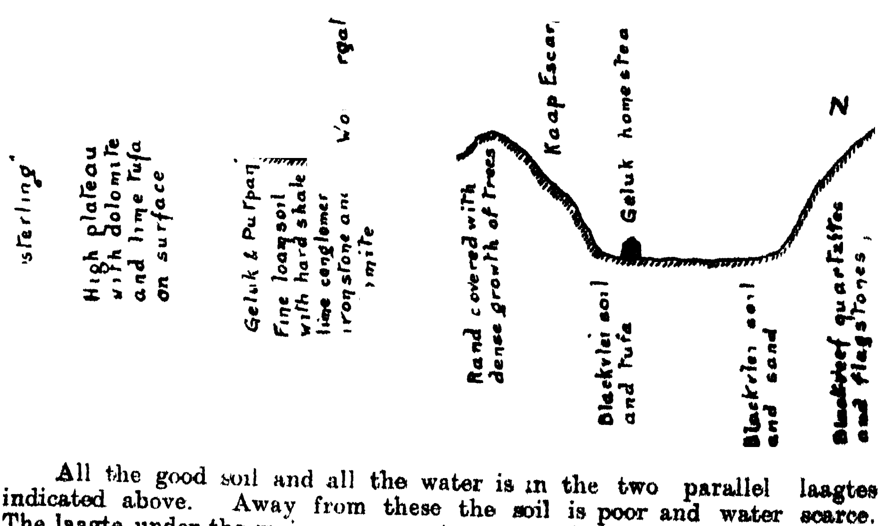
Driehoek is similar except immediately round the fountain where some wheat was being irrigated.

On Kalahari, Boomplaats and Holpan the veld is better, there being greater depth of sandy covering

(107) —On "Hartebeeste Bult" and "Middelvlei" the country further improves. The veld looks sweeter; on the latter farm there is a considerable amount of cultivation, and several pans with a little water For miles around Middelvlei the veld has been burnt out

On Middelvlei I descended down the escarpment which runs generally from north-east to south-west The country below consists mainly of blackreef formation and forms a continuous laagte as the ground rises again to the north-west parallel to the Kaap plateau escarpment. Passing through Zoet Vlei along the foot of the escarpment, which is densely covered with kameeldoorn and mimosa, the farm Geluk is reached. There are some magnificent trees along the escarpment but much wicked destruction is going on, as we are here near enough to Vryburg and the railway to make wood cutting commercially feasible. The bolt is particularly fine on Geluk and Putpan and here the late Mr H. Abt, and his brother, Mr. D Abt, as long as he was there did everything he could to protect the trees.

(108).—*Geluk and Putran* —These farms are very much favoured An approximate section of the country north and south is as under:—



All the good soil and all the water is in the two parallel laagtes indicated above. Away from these the soil is poor and water scarce. The laagte under the main escarpment assumes the character of a vlei and is known as the Geluk River. Water is here very near the surface and there are numerous springs.

A short distance above the homestead a fairly large dam is fed mainly by a strong spring issuing from the Black Reef rocks on the left side which is led to the dam in a furrow to a pit, whence it is lifted some 10 feet by a 16′ windmill and this gravitates in an open furrow to a leading dam in the Geluk garden which under Mr. Abt's care was probably the finest in Bechuanaland. The garden and orchard are well laid out and almost every variety of fruit and vegetable of the best kind are to be found here. There are two wells in the garden with water a few feet from the surface in each. Mr. Abt has done a great deal in the way of tree planting and large numbers of Aleppo and Cluster pine, Beefwood, Eucalyptus and Oak trees are thriving well.

In the laagte above the dam some dry cultivation is being done in the vlei but before this can be developed as it should be, drainage is essential and this could be done at no great cost, preferably by means of French drains. At present the lands are badly water logged and crops suffer.

On the high ground about a mile from the homestead is situated the famous "Wondergat" which is a natural well which formerly maintained its water level at all seasons at a depth of 17′ below the surface.

(109).—In 1898 Mr. Herman Abt applied to Government for the services of an engineer in connection with an ambitious scheme to utilize the water from this "hole" and lead it down to the laagte or vlei on Putpan where some 800 acres of irrigable land was to be laid out in 5 acre lots. Mr. Abt's original idea to pump was disapproved of by the advising engineer and after further applications an elaborate and costly scheme was drawn up by Mr. O'Brien by means of which water was to be led from the well to the lands by gravitation. The scheme consisted in opening out the well and lining it, and leading the water in a tunnel and deep open cut out on to the land below. Work was estimated to cost £2,000 but cost actually twice that amount owing to the hardness of the material encountered. Operations were commenced in 1899 on the scheme, which was estimated to irrigate 150 acres. Work was stopped during the war but was resumed in 1903 and completed to its present state in 1904. When Mr. O'Brien, assistant engineer, inspected the works and made a four day test of the yield, which during that period diminished from 225,000 to 100,000 gallons per diem. After stopping pumping for 48 hours the water resumed its old level again. The scheme has been a dismal failure The lower third of the cutting is in sandy soil and this length absorbs all the water which flows down the deep cut from above and would have to be lined throughout. The work has been left untouched since M. H. Abt's death in 1905. All the shafts and to some extent also the deep cuttings have fallen in and a great deal of costly clearing and lining out would be necessary to reopen the work. A small trickle of water is still forcing its way along the cutting through the debris until the sandy portion is reached where it immediately disappears. The well at the head is built up with drystone walling and is in good order but water level has now fallen from 17 to 25 feet below surface.

I consider the whole scheme a mistake and that the money spent has been largely wasted. From the well for some 5,000 feet along the furrow there is a great area of very good loamy soil of depths varying from 3 to over 20 feet and good crops of mealies, kaffir corn, turnips, and grass were being grown up here by Mr. D. Abt. Instead of sinking even £2,000 into the gravitation scheme, pumping should have been tried first. A couple of large windmills would have done great things here and would at small cost have brought in an immediate return and would have irrigated some land far better suited for the purpose than the vlei soil over a mile away. A small oil engine and centrifugal pump would have been the best solution of the problem. As it is £4,000 has been spent and another £2,000 would be required to get the gravitation scheme to work as an

open conduit though I am certain that nothing but a pipe line would be permanently satisfactory, as a narrow cut with vertical sides 20 to 30 feet deep must sooner or later give rise to heavy maintenance expenditure and loss of water. I should recommend stopping the flow into the tunnel and pumping the water on to the rich soil immediately surrounding the Wondergat, or failing that, if it is still desired to lead the water out on to the vlei land below, it would be cheapest to lay a pipe line from the well in the tunnel and trench and fill it up again. In its present state the works cannot be considered as an asset on the farm as it would be cheaper to pump on to the land surrounding the Wondergat than to make any use of the works.

Both these farms are of exceptional value and are connected with Vryburg 30 miles away by a good road most of which is metalled and it is much to be regretted that this ill considered scheme should have wrecked the fortunes of a man whose greatest wish was to establish a prosperous settlement here.

On the southern edge of "Putpan" and on "Eersteling" some very rich specimens of copper ore have been found and there are evidently rich ores in the neighbourhood.

(110).—From Putpan the road leaves the escarpment and traverses the plateau again. The country passed through is very poor and Lochnagar is the only place of interest and that mainly geological. The presence of formation other than the dolomite at once shows itself in the presence of red sandy soil and dense bush. One of the main tributaries of the Dry Hartz River, viz., the Brussels Spruit, which commences near the farm Eersteling, passes close to the road and homestead on Lochnagar and there are numerous springs and dams along the river both on this farm and on the adjoining Native Reserve of Takwanen. All along the Brussels Spruit there are strong indications of underground water and much could be done by means of windmills or perhaps bakkies pumps. Few of these farms are, however, worked by their owners. The Kaap escarpment begins again on the farm Kaaiplaats or Klondike immediately to the west of Vryburg.

(111).—Mr. Burrows visited the farm Grootefontein belonging to Count Plater and Mr. Meyer, which lies in the heart of the Kaap plateau and has become well known on account of the struggle of its owners, who are cattle farmers, against the ravages of certain diseases common to the "Kaap."

(112).—*At Groot Fontein*, owned by Messrs. Mayer and Count Plater, there are several springs, one of which was dry and the others very weak at the time of his visit. It was asserted, however, that after one good season's rain, the springs remained strong for several years. These springs are led by furrows to long narrow strips of ground which are well cultivated; in order to increase the cultivable area, the owners propose to drain the vlei, and to this end some levels were taken. The whole of the plateau is crossed and recrossed by water veins, and water may be found almost anywhere, near the surface, but only small patches of irrigable ground are available owing to the rock (dolomite) being at or near the surface generally, over the greater portion of the plateau.

APPENDIX A.

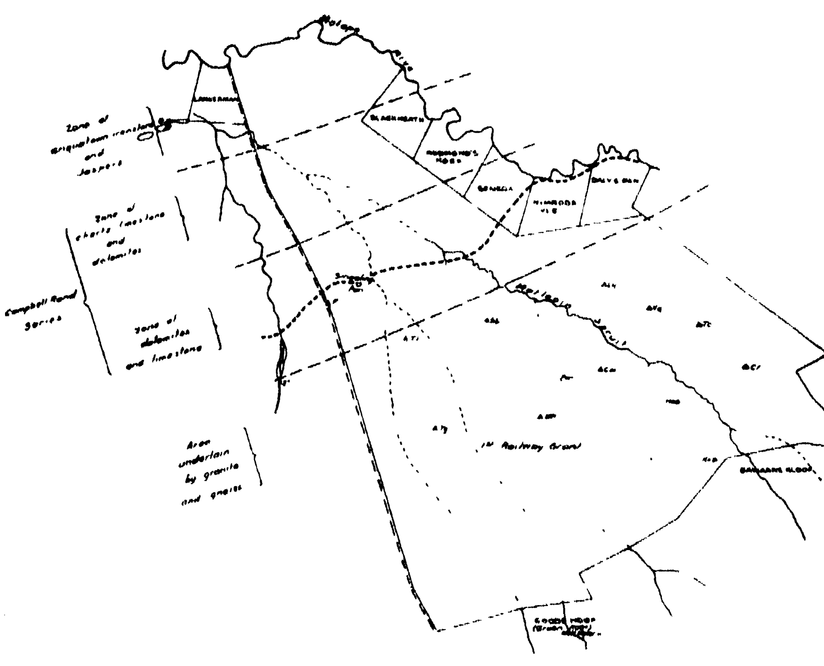
REPORT ON THE WATER RESOURCES OF THE FIRST RAILWAY GRANT, MAFEKING.

The western Railway Grant covers an area of about 670 square miles, and consists of a flat tract of sand and grass covered land dotted with thorn trees. The trees become more numerous towards the north and form a thick belt about five miles in width bordering the Molopo. The area is traversed by several shallow

valleys or "Laagtes," of which only one, the Matlapin Spruit, was surveyed; the approximate positions of the others was given me by Mr. Ashton, Government Land Surveyor.

Geology.—Over the whole of the area the underlying formations are concealed by a thick covering of superficial deposits—sand, limestone, and surface quartzite—like those described on the Eastern Railway Grant. From the exposures and well sections in the adjoining portions of Mafeking and Vryburg, it was possible to trace the approximate limits of the underlying granite, dolomites (Campbell Rand series), and jasper-ironstones (Griquatown series), as indicated on the plan attached. It is possible that the belts when they are proved in boring may curve a little more to the north-east in approaching the block of farms Blackheath—Daly's Pan.

Water Boring.—The best results may be expected by locating the sites of the boreholes as far as possible in the laagtes, and the higher ground should be avoided. The heads of the laagtes lie at a considerable distance to the south of the Grant, thus ensuring a steady underground flow of water. At several places, *e.g.*, Baviaan's Kloof and Good Hoop (Groen Kooi) there are shallow wells showing that the water is at no great depth. In fact at the latter the well is only a few feet deep, showing that the amount of water available must be considerable. In all probability the depth of the permanent water level will increase somewhat as one proceeds down each laagte. At several points in the laagtes there are small fragments, and occasionally exposures, of calcareous tufa, and the borehole sections may be expected



to show a considerable thickness of tufa, sand and granite-wash before the decomposed granite or gneiss is reached. The west portion of the Grant is very well suited for boring. The centre is not so advantageously placed, but there are several little "laagtes" which lead into the main ones, and advantage should be taken of their presence.

The extreme East of the Grant is badly situated, as the Matlapin Spruit has no small tributaries leading into it from the east. There may possibly be some pans at which boreholes can be put down, but as experience has shown that the granite is very compact at a shallow depth on the high ground, there is always the possibility of waterless holes.

It may therefore be advisable to cut up this portion of the Grant into long narrow farms, so spaced that each farm encloses a short length of the Matlapin Spruit. Such a policy should as far as possible be carried out over the whole area, and the easiest way would be for the Surveyor and the Boring Engineer to work together upon the Grant.

The granite is succeeded to the north by the Campbell Rand limestone and dolomite, with a thin development of quartzites (the Black Reef series) at its base. The dip of the strata is at an angle of two or three degrees to the N.N.W. The

dolomite is compact and uniform in character, and has occasional thin shaly bands. The lower part of the formation is remarkably free from layers or concretions of chert, and in this portion, constituting a belt about six miles in width, I anticipate very good results

In the adjoining area (towards Morokwen) there are several permanent sources of water located on this zone, *e.g.*, Mositlani Pan and Quarree Fontein.

The dolomite will not be difficult to bore, but I would recommend the jumper drill for this formation, there being occasional cavities and joints in the rock as well as thin layers of chert which might injure a diamond crown.

The upper portion of the Campbell Rand series consists of limestones and dolomites with thick massive beds of intensely hard grey and black chert, and this zone which I have indicated on the map should be approached with caution, but it is quite possible that the rocks are deeply buried. Should the drill be stopped by hard chert another site should be selected not very far off, and either to the north or south, as the cherts will alternate with rather thick beds of dolomite and limestone.

Although no outcrops of the Griquatown series are seen east of the Vryburg boundary, these beds evidently extend below the sand and across beneath the Molopo, as is indicated by the abnormal deflection of the compass needle near Blackheath.

The rocks are hard, well-banded brown, black, and red jaspery ironstones in which it is not reasonable to expect any supplies. The beds may be deeply buried however. I would recommend that the farms should be arranged so as to extend lengthwise down to the Molopo.

Shallow borings at the edge of the Molopo will be sufficient to ensure a plentiful supply of water. The natives along the Molopo from Mafeking downwards draw all their supplies from shallow wells dug in the bed of the river.

Boring operations ought to be commenced at the south western corner of the Grant.

(Sgd.) ALEX L. DU TOIT,

June 12, 1907.

APPENDIX B.

REPORT ON FIRST RAILWAY GRANT BETWEEN PITSANI AND MOSITA.

This grant consists of a wide flat rising some 150 to 200 feet above the level of the Molopo and Setlagoli Rivers, between which it is situated. On the north-eastern boundary there is a gentlewooded rise, and on the south an abrupt descent to the Setlagoli River, and there are two steep sided depressions, rather abrupt, on the north, which are formed by the Mobelo and Logogani spruits.

This wide, waterless area is covered with a third mantle of pale drab or reddish sand, and the underlying geological formations can only be inferred from the few sections which are seen in the outside area, more especially along the river valleys.

Geology.—Along the Molopo, Mobelo, Logogani and Setlagoli rivers there are sections as follows :—

1. Reddish sand which gets thicker away from the river, and which must in some places attain a considerable depth.

2. A hard white or pinkish calcareous tufa, sometimes pebbly and conglomeratic, and always much silicified and frequently of intense hardness. In a number of places it contains a layer of deep brown or black ironstone gravel (laterite). It forms a compact bed which frequently exceeds 30 feet in thickness. It becomes softer towards its base and rests on—

3. A pink to red marl or mudstone, probably also a recent deposit. This last is of unknown thickness in the north, but on Steil Hoogte (in the south), it directly overlies the granite.

It is not clear whether the deposits (2) and (3), which are exposed along the river channels extend inwards beneath the sand and underlie the entire grant, but it is most probable that they will be penetrated on its northern, western and south-western portions.

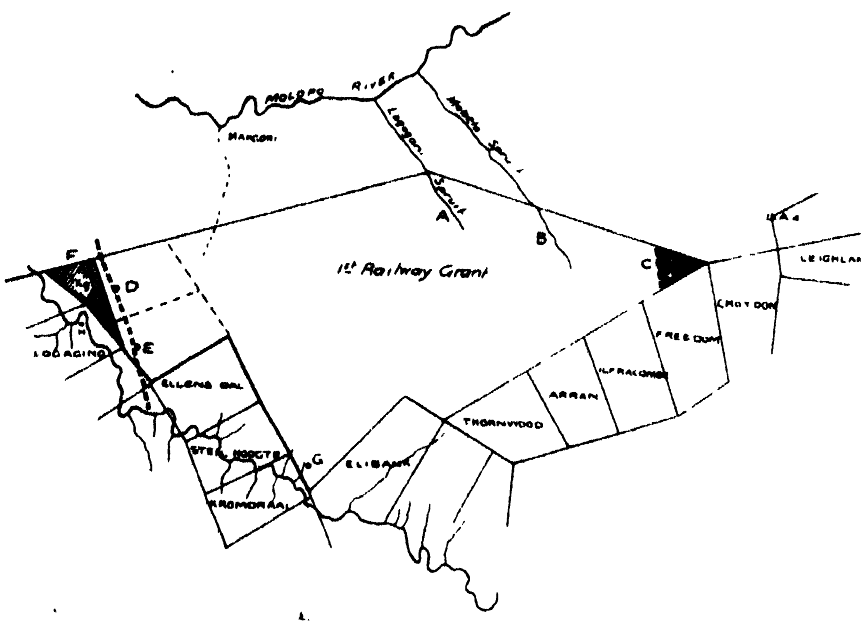
The rocks underlying these superficial deposits will be principally granite, gneiss, and certain hornblendic rocks, these being exposed from Steil Hoogte upwards along the Setlagoli River.

Borings at Clober, Mopasgom, etc., show that the granite is a rather compact variety south of the river, but to the north it appears to be more decomposed (Wienan) and in places (West End) it has a well foliated character which is favourable to water supply.

The greater the thickness of superficial deposits, as a general rule, the greater will be the probability of finding the granite decomposed and waterbearing.

There is a certain formation composed of magnetic quartzites, banded cherts jaspers and diabases, which is found at the eastern and western extremities of the Grant, and which should be avoided. These areas are indicated by shadings C. F. on the plan. For the same reason a small and sudden rise in the surface of the ground should be suspected as being caused by a hidden ridge of these rocks.

Associated with these hard beds is a belt of soft calcareous schist, dipping nearly vertically, and which are exposed along the river on King's Mill. The zone



is about 150 yards wide, and its probable extension northwards below the sand and tufa to the east of the beacon Kg. is indicated as accurately as possible on the plan annexed.

I would recommend that two boreholes, D. and E (or at other points along the zone, if necessary), should be sunk so as to penetrate this belt of schists. The sites will have to be located on the ground, from the annexed plan by actual survey during the cutting up of the Grant into farms.

Where the Grant comes down almost to the river in the angle between the farms Kromdraai and Eli Bank, a borehole might be located, *e.g.*, at the site marked G.

Conclusions.—The area is thinly wooded, and perhaps one may, therefore, be justified in expecting that the underground resources will not be quite so large as could be desired.

A typical example of the section to be expected may be taken from that obtained from the farm Wienan, and I think that over the entire Grant water will be found in the granite at a moderate depth.

The boring sites can therefore be selected by the foreman after the Grant has been cut into farms.

Two boreholes might be put down in the Logogani and Mobelo Spruits.

Two sites D. and E. are marked on the plan, at which schists may be expected.

Boring should commence from the western portion of the Grant; there are good roads here, the farms are occupied, and water can be obtained at Logaging, a few miles distant from the sites D. and E.

A small amount of water is to be found at Leighland and a little north of Croydon, but the supplies cannot be depended upon.

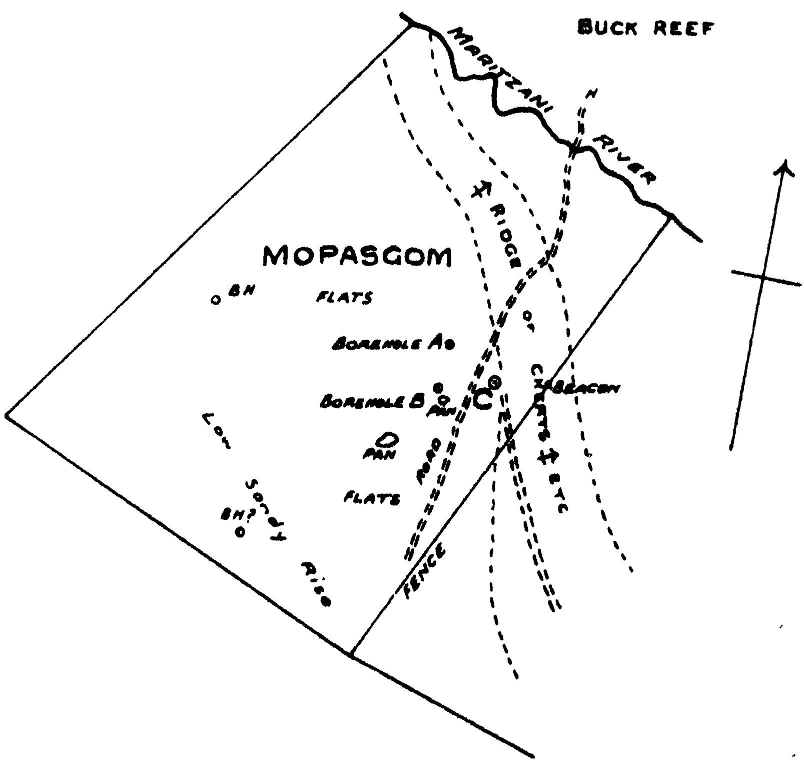
(Sgd.) ALEX. L. DU TOIT.

March 30. 1907.

APPENDIX C.

REPORT UPON SITE FOR BORING ON THE FARM MOPASGOM.

This farm is traversed by a wide, central flat covered with dark earth and supporting a good vegetation On the west there is a low sandy rise, and on the east



a long ridge formed by intensely hard, banded, magnetic quartzites and ferruginous cherts, which are contorted and dip at a high angle towards the east.

Although the central flat would appear to be a tract favourable for boring, it has been found that a hard compact granite exists at a shallow depth, while the same is the case in the west of the farm.

The strata being greatly hidden by sand, it is extremely difficult to indicate where one could bore with the remotest possibility of success, but as a last resource I can only point out the site C. on the accompanying plan. This lies east of the road where the ground becomes sandy and bush-covered and slopes up towards the belt of cherts.

These latter rocks are accompanied by beds of chloritic slate and schist, sheared diabase, etc., which are water bearing; owing to their softness they are commonly hidden by superficial deposits.

There is reason to believe that the cherts are flanked by such schists, while the whole belt holds its position (between areas of granite) to faulting and thrusting. The granite will most probably be crushed and sheared at the contact of the two formations.

I think that a borehole close in to the ridge nearly midway between borehole B. and the beacon will penetrate either sheared granite or the schists accompanying the belt. If the granite proves too hard, the drill can be moved to the east, while if the cherts are struck, it should be moved towards the west.

The cherts are accompanied by a similar belt of slates on its east side, but this would bring the supply too close to the river.

I do not see any more suitable spot than the one which I have indicated; at the same tin · I must admit that there is a considerable possibility of non success.

(Sgd.) ALEX. L. DU TOIT.

March 30. 1907

APPENDIX D.

ANALYSIS OF SOIL.

Report on the analysis of six samples of soil from Kuruman, submitted by the Chief Inspector of Public Works, under cover of his letter No. 13/733, dated the 31st July, 1903.

The following samples were submitted :—

No. 1.- Sample from north-east of Mission property—2 ft. below surface.
No. 2.—Sample of surface soil near furrow, middle of Mission property.
No. 3.—Sample of surface soil in front of Mission Station.
No. 4.—Sample of surface soil from south-east portion of Mission property.
No. 5.—Sample from Dakwent Valley -12 inches below surface.
No. 6.—Sample from Crown Reserve, south of Mission property, three feet below surface.

The following are the results of the analysis :-

No.	Percentages in original soil. Fine earth below ½ mm.	Percentages in Soil sifted through 1 mm. sieve.				Percentages in Soil sifted through ½ mm. sieve.		
		Water.	Organic Matter.	Chlorine.	Nitrogen	Lime.	Potash.	Phosphoric Oxide.
1	76·36	1·006	1·484	0039	·029	·026	·024	·024
2	100	13·562	38·218	0123	1·435	3·66	·030	·182
3	88·72	2·888	7·542	·0074	·200	4·80	·084	·088
4	85·24	3·536	4·988	·1170	108	6·32	·059	·056
5	94·74	4·158	6·752	·0042	193	14·04	·028	·059
6	87·12	1·864	2·126	0018	·071	·278	·068	·026

Referring to the determinations of lime, potash and phosphoric oxide to the original soils. the following figures are obtained :—

	Lime.	Potash.	Phosphoric Oxide.
No.	·020	·018	·018
.	3·66	·030	·132
. ...	4·26	·075	·078
	5·39	·050	·048
	13·30	·027	·056
	·242	·059	·023

Samples Nos. 1 and 6 are deficient in phosphoric oxide, and are also poor in lime, No. 1 being an all round poor soil. Samples Nos. 2, 3, 4 and 5 are rich in lime, and No. 2 also contains a fair amount of phosphoric oxide. The samples are all poor in potash. The amount of chlorine in the soils is small and they should be very suitable for cultivation.

(Sgd.) A. J. J. B. SIMONS, Analyst.

APPENDIX E.

ANALYSIS OF WATER FROM KURUMAN.

Government Analytical Laboratory,
Cape Town, Cape of Good Hope,
31st October, 1903.

Report on the analyses of two samples of water from Kuruman submitted by the Chief Inspector of Public Works, under cover of his letter No. 13/733, dated the 31st July, 1903.

The samples were labelled as follows :—

No. 1.—Sample from fountain, Seodin Mission Station.

No. 2.—Sample from stream, Seodin Mission Station.

No. 1 contains 23·4 grains of total solids per gallon of water, while No. 2 contains in 1 gallon 15·2 grains of total solids. The amount of chlorine is the same in both, viz., ·53 grains of chlorine per gallon of water.

Both samples are suited for irrigation purposes.

(Sgd.) A. J. J. B. SIMONS, Analyst.

The Chief Inspector of Public Works.
Transmitted.

(Sgd.) CHAS. F. JURITZ,
Senior Analyst.

ABSCESSES IN THE LUNGS AND LYMPHATIC GLANDS OF SHEEP.

CASEOUS LYMPH ADENITIS

By WALTER JOWETT, F.R.C.V.S., D.V.H., Veterinary Department, Cape Town.

During the past three years the attention of the writer has been drawn on several occasions to the occurrence of the above-mentioned disease, which is characterised by the presence of abscesses in connection with certain of the lymphatic glands (kernels), or the lungs of sheep. Not only has one observed these abscesses and caseous glands in sheep which before slaughter seemed in good health, but also in others thin and anæmic from various causes. That the condition now referred to is prevalent in the Colony the following extracts from a letter written by a sheep owner will show:—"I have been in the habit," he states, "of killing all sheep that show symptoms of Tuberculosis (*sic*)—heavy breathing and coughing—these in most cases, when examined after death, show the presence of large abscesses in the lungs surrounded by a tough gristly matter."

It will be noticed that he wrongly considered these abscesses as tuberculous. As a matter of fact they are in no way related to the disease tuberculosis—a disease which, in sheep, is extremely rarely met with. The correspondent continues: "I should be very glad of further information on the subject of this disease (*i e.*, abscesses in the lungs of sheep). Is it fatal to the diseased animal, and is the disease in any way infectious? *Cases are becoming frequent among our flocks.*"

Not long after writing the above, some of the lesions mentioned were forwarded for our examination. In a second letter accompanying these specimens the sender observes "the only symptoms I am able to detect is a cough . . . *every sheep I have killed up to the present, without a single exception, has had abscesses on the lungs in one form or another.*"

Without entering into unnecessary details one may mention that the material forwarded for examination comprised:—

1. Abscesses with very thick fibrous walls and viscid greenish-coloured purulent contents.

2. Lymphatic glands wholly or partially converted into greenish-coloured purulent or caseous material enclosed within thickened capsules.

These lesions were from the lungs, bronchial, cervical, and mediastinal glands, and from them we succeeded in isolating a short thick bacillus which after appropriate microscopical examination and cultural and inoculation experiments was identified as the bacillus of Priesz-Nocard and the lesions as those of caseous lymph adenitis.

It is unnecessary in this place to enter into a minute description of the morphology, cultural characteristics or to quote the details of our experiments; briefly, the organism we have encountered agrees in every respect with that described by different investigators in other countries where the disease is known. As already remarked, we have encountered the lesions of the disease now under consideration on several occasions during the past three years, and Government Veterinary Surgeon Dixon informs us that he has not infrequently seen similar lesions when conducting *post mortem* examinations on sheep in certain parts of the Colony, notably in the Karoo. Apparently, therefore, the condition is by no means uncommon, and whilst this caseous lymph adenitis cannot be described as a highly fatal malady or even as of vast economic importance, nevertheless both amongst sheep owners and those entrusted with meat inspection there appears to exist much confusion and misunderstanding in regard to its real nature.

The writer is aware of more than one instance in which the carcases of sheep suffering from this complaint have been wrongly declared tuberculous and in consequence condemned as unsound and unfit for the purpose of human consumption. A brief description of the lesions and the malady then may not be without interest.

Caseous lymph adenitis has been studied and described by Priesz and Guinard in Europe, also by Turski in West Prussia, and by Cherry and Bull in Australia. In the Argentine Sivori found 10 per cent. of the older sheep killed at the Buenos Aires abattoirs affected with the disease—the lesions were rarely encountered in lambs. In the United States of America the disease is apparently quite prevalent, and has been well described by Norgaard and Mohler One can find no previous mention of the existence of the disease in this Colony

Symptoms.· Whether naturally contracted or experimentally induced, the disease makes extremely slow progress in sheep, consequently in young subjects well marked lesions are rarely found, as such animals have not been allowed to live long enough for well marked abscesses to develop. Advanced lesions occur mainly, then, in older animals, especially in old breeding ewes. In the latter there may be noticed a cough, wasting, and perhaps enlargement of some of the superficial lymphatic glands (kernels), but, on the other hand, caseous lymph adenitis frequently gives rise to no symptoms apparent during the life of the infected subject, and its presence is only detected after slaughter.

But though the malady pursues such a chronic course under ordinary conditions, there is no doubt that it makes more headway in an animal weakened through some adverse influence, such, for example, as the presence of parasites, wire worms, nodular disease of intestines, fluke, insufficient food, etc. We have seen very well marked lesions in sheep the subject of another ovine malady, a chronic pneumonia known as Jagziekte. As compared with those of a healthy subject, the tissues of an animal weakened by any such adverse influences naturally offer less resistance against the encroachment of the causal organisms of this (caseous lymph adenitis) as of other diseases. On the other hand, however, we have seen typical lesions of the disease now under consideration in the carcases of animals slaughtered for food purposes which, prior to slaughter, appeared in ordinary good health and condition, and in which, after death, no other evidence of disease could be found.

Post-mortem Appearances.--As the name "caseous lymph adenitis" indicates, the disease is one implicating the lymphatic system. The majority of the lesions consists of abscesses containing thick viscid *greenish coloured* pus enclosed within thick fibrous walls; the application of the term "caseous" to such lesions perhaps hardly seems appropriate, but in older lesions one finds a semi-caseous material enclosed within the thick fibrous

walls, and occasionally the contents are found to have been converted into a dry mealy mass. It would seem that calcification of the degenerated products occurs rarely, if at all, in this disease. Practically almost any of the lymphatic glands of the body may be implicated in the diseased process; sometimes only one gland may be affected, occasionally several. The lungs not infrequently contain one, two or more abscesses similar to those found in the glands. Lesions have been described by certain writers in the liver and kidney,—these organs, however, are rarely affected, and personally we have not yet encountered such cases. Of the lymphatic glands those most frequently affected are the bronchial and mediastinal (contained in the chest and in connection with the lungs), the prescapular (in the muscles in front of the shoulder), the precrural (in front of the stifle joint), the cervical (neck region). The portal (liver) lymphatic glands occasionally show lesions, as also do the mesenteric glands, the latter, however, but rarely. It is stated that the retropharyngeal and submaxillary lymphatic glands (the former situated in the throat and the latter under the base of the tongue) are practically never affected.

In any or all of these different situations the lesions present a close similarity in appearance. *Especially striking are the thick fibrous walls of the abscesses, and the greenish coloured purulent or caseous contents.* (These abscesses containing greenish coloured pus must not be confounded with those which occur not infrequently in connection with the intestines of sheep, the so-called nodular disease of the intestine—"Knoopen in de Darmen" - due to a small nematode worm, and consequently of an altogether different nature to the lesions now under consideration) In case of doubt the expert would verify the diagnosis by examining a scraping *from the periphery* of one of the lesions, the specific organism from such site being readily demonstrated through the microscope after appropriate methods of staining. Its cultivation in the laboratory on suitable artificial media presents but little difficulty to one acquainted with the details of investigations of this nature and the inoculation of such artificial culture (in the same way as inoculation of emulsion prepared directly from an abscess wall) unfailingly produces the disease in susceptible experimental animals, the same whether such material be injected under the skin, into a vein, or into one of the body cavities We have produced the disease in this manner in rabbits and guinea pigs, as well as in sheep. Attempts to infect sheep by the administration to them of virulent material by the mouth, failed in our hands. There is no doubt, then, that caseous lymph adenitis is readily transmissable from a diseased to a healthy animal—in other words, it is contagious.

Preventive Measures.—Animals presenting symptoms which lead one to suspect the presence of this disease should be isolated or, preferably, slaughtered, in order to prevent its extension to the in-contacts. Unfortunately, however, in very many instances the existence of the disease cannot be detected during the lifetime of the infected sheep; this, of course, handicaps one enormously in attempting to eradicate the malady from a flock.

In countries in which the disease is prevalent the following is the procedure usually adopted in dealing with the carcases of sheep the subject of caseous lymph adenitis:—

1. If only slight lesions are encountered in a carcase otherwise healthy and well nourished, every trace of diseased tissue is removed and destroyed, the remainder of the carcase being utilised for food purposes.
2. If extensive lesions are present and the carcase is poor (emaciated) and dropsical, it should be condemned and destroyed in its entirety.

ANALYSIS OF PRIZE WINES AND SPIRITS.

Report on the analysis of thirty-eight samples of wine and two samples of spirit submitted by the Secretary to the Western Province Board of Horticulture in connection with the Wine Show held on the 27th October, 1909, and referred for analysis by the Under Secretary for Agriculture in terms of his minute, No. B 6506/A2, dated the 4th instant.

The following are the analytical results:—

WINES.

Class.	No.	Description of Sample.	Prize.	Alcohol by Volume per cent.	Proof Spirit per cent.	Extract per cent.	Total Acid as Tartaric per cent.	Volatile Acid as Acetic per mille.	Sulphurous oxide milli-grammes per litre.
I		*Hock type:*							
	1	Drostdy Co-operative Winery, Tulbagh	1st	14·54	25·48	2·132	·594	·690	
	2	P. & P. Rabie, Nuy Siding ...	2nd	13·16	23·06	2·032	·523	·462	
	3	James Malan, Constantia ...	3rd	13·38	23·45	1·904	·554	·508	
II		*Sauterne type:*							
	4	Klein Constantia Estate, Constantia ..	*1st	14·35	25·14	2·186	·622	·546	98
	5	J. A. Brink, Constantia	2nd	14·85	26·02	2·228	·538	·498	Nil
	6	P. & P. Rabie, Nuy Siding ...	3rd	13·16	23·06	1·848	·532	·456	74
III		*Sherry type:*							
	7	James Malan, Constantia	1st	13·05	22·88	1·954	·557	·552	
	8	E. Lange, Koelenhof	2nd	13·82	24·21	2·584	·398	·642	
IV		*Madeira type:*							
	9	Drostdy Co-operative Winery, Tulbagh	1st	15·53	27·21	10·050	·467	·792	
V		*Sweet White Wine.*							
	10	P. & P. Rabie, Nuy Siding	1st	13·84	24·25	25·550	·358	·144	
	11	Drostdy Co-operative Winery, Tulbagh	2nd	13·50	23·63	21·950	·339	·348	
VI		*Stein:*							
	12	Klein Constantia Estate Constantia ..	*1st	14·36	25·16	2·202	·616	·558	107
	13	O. Rathfelder, Constantia	2nd	14·16	24·72	2·263	·731	·480	72
VII		*Green Grape:*							
	14	Drostdy Co-operative Winery, Tulbagh	3rd	14·21	24·80	2·242	·467	·7·4	Nil
VIII		*White French:*							
	15	Drostdy Co-operative Winery, Tulbagh	1st	13·52	23·70	2·379	·616	·576	84
IX		*White Wine:*							
	16	C. W. H. Kohler	1st	13·77	24·13	1·972	·345	·564	16
	17	P. & P. Rabie	1st	13·77	24·13	1·975	·522	·522	[illegible]

Wi

WINES—*continued.*

Class.	No.	Description of Sample.	Prize.	Alcohol by Volume per cent.	Proof Spirit per cent.	Extract per cent.	Total Acid as Tartaric per cent.	Volatile Acid as Acetic per mille.	Sulphurous oxide, milli-grammes per litre.
X		*Claret type:*							
	18	High Constantia Estate	1st	13·77	24·13	2·464	·429	·504	Nil
	19	Hohenort Estate...	2nd	11·08	19·42	1·960	·540	·528	"
	20	F. Versfeld	3rd	12·40	21·73	2·174	·532	732	"
XI		*Burgundy type:*							
	21	Alphen Winery	1st	13·09	22·98	2·374	·540	·696	"
	22	J. A. Brink	2nd	13·70	24·01	2·668	·465	·612	"
	23	High Constantia Estate	3rd	14·18	24·85	2·406	·472	·540	"
XII		*Heavy Dry Red Wine:*							
	24	G. A. Retief	1st	24·32	42·62	8·880	·390	·558	"
XIII		*Heavy Sweetish Red Wine:*							
	25	Drostdy Co-operative Winery ...	1st	14·36	25·16	24·510	·375	·540	"
XIV		*Sweet Red Wine:*							
	26	P. & P. Rabie	1st	12·99	22·76	27·650	·397	·120	"
	27	Drostdy Co-operative Winery	2nd	13·24	23·21	25·360	·446	·692	"
XV		*Hermitage:*							
	28	J. A. Brink	1st	12·02	21·05	2·185	·518	·600	"
	29	Hohenort Estate	2nd	11·10	19·46	1·995	·540	·528	"
	30	Alphen Winery	3rd	14·00	24·54	2·259	·502	·583	"
XVI		*Cabernet:*							
	31	F. Versfeld	1st	12·56	22·03	2·551	547	·684	"
	32	J. A. Brink	2nd	12·47	21·86	4·791	·439	·606	"
	33	High Constantia Estate	3rd	13·67	24·96	4·507	·480	·612	"
XVII		*Pontac:*							
	34	G. A. Retief	1st	19·91	34·90	9·855	·427	·504	"
	35	P. & P. Rabie	2nd	17·52	30·72	4·015	·622	·462	"
	36	Alphen Winery	3rd	16·41	28·75	3·341	·532	·936	"
XXII		*Jagger Cup:*							
	37	P. & P. Rabie	1st	13·15	23·04	2·028	·522	·462	—
XXIII		*Merchants' Cup:*							
	38	F. Versfeld	1st	12·68	22·22	2·550	·547	·648	—

SPIRITS.

Class XIX.—*Wine Brandy:*

First Prize.—High Constantia Estate.

Alcohol ...	50·9	volume per cent.
Proof Spirit	89·2	per cent.
Extract	·220	per cent.
Volatile acid	78·9	
Furfural	·1	
Aldehydes	21·8	
Apparent Ethers	181·5	
Higher Alcohols (Allen Marquardt)	284	
Total secondary constituents ...	566·3	

Class XX.—*Van der Hum:*

1st Prize.—High Constantia Estate.

Alcohol volume per cent.	35·97
Proof Spirit per cent.	63·03
Extract per cent	43·97

J. LEWIS, M.A., Analyst.

MILK RECORD.

ELSENBURG COLLEGE HERD.

Subjoined is the Milk Record to the 30th November, 1909 :—

Breed and Cow	Days in Milk.	Yield in Lbs. During November.	Yield in Lbs. Total to date.	Daily Average.
FRIESLANDS.				
Cleopatra	211	720	8,531	40 4
Victoria	2 2	755	7,643	37·8
Vera	160	785	4,646	29·0
Violet	141	786	4,889	34·7
Bell	129	1,128	5,665	43·9
Belladonna	92	642	2,343	25 4
Rose	25	1,142	1,142	45·7
JERSEYS.				
Gertie	204	648	5,244	25·7
Gwendolen	160	653	3,921	24·5
Grace	160	567	3,304	20·6
Gladys	153	707	4,094	26·7
Gus	110	471	2,703	24·5
Fanny	98	581	2,181	22·2
Gilliflower	91	783	2,800	30·7
Glee	44	733	1,101	25·0
AYRSHIRES.				
Queen Dot	149	577	3 820	25·6
Lobelia	138	671	3,902	28·3
SHORTHORN.				
Maggie	139	860	4,458	32·0
CROSS.				
Bessie	160	1,098	7,341	45·9

CAPE PRODUCE CONDEMNED IN THE TRANSVAAL.

Return of Vegetable Produce from Cape Colony condemned by Transvaal Plant Inspectors at Johannesburg and elsewhere during the months of July, August and September, 1909.

POTATOES.

July 5.—Gasson & Co., Queenstown, 82 bags, Eelworm, 25 per cent.
„ 6.—I. W. Bosman, Worcester, 20 bags, Nectria solani, 7½ per cent.
„ 7.—Greyvenstein Bros., Molteno, 13 bags, Eelworm, 10 per cent.
„ 9.—Kaplan Bros., Bot River, 8 cases, Nectria solani, 11 per cent.
„ 12.—Consignor unknown, 50 bags, Eelworm, 6 per cent.
„ 12.—Taitz, Mitchell & Co., Port Elizabeth, 6 bags, Eelworm, 10 per cent.
„ 12.—Duncan Bros., Queenstown, 100 bags, Eelworm, 1½ per cent.
„ 13.—A. Apirion, Burghersdorp, 8 bags, Eelworm, 12 per cent.
„ 14.—N. D. Deary, Molteno, 25 bags, Eelworm, 4 per cent.
„ 14.—W. T. Hogsett, Dordrecht, 40 bags, Eelworm, 2½ per cent.
„ 14.—H. Gordon, Elliot, 12 bags, Eelworm, 1 per cent.
„ 15.—Joubert, Ashton, 25 bags, Eelworm, 8 per cent.
„ 16.—H. Becker, Aliwal North, 2 bags, Nectria solani, 10 per cent.
„ 17.—Dormer & Neethling, Cathcart, 20 bags, Fusarium solani, 5 per cent
„ 17.—Knight & Co., Dordrecht, 50 bags, Fusarium solani, 5 per cent.
„ 18.—Kremer Bros., Kimberley, 5 bags, Eelworm, 8 per cent.
„ 18.—P. W. Lotz, De Wet, Worcester, 45 bags, Eelworm, 9 per cent.
„ 19.—N. D. Deary, Molteno, 25 bags, Fusarium solani, 2½ per cent., Phytophthora infestans, 2 per cent.
„ 19. L. O. Buirski, Robertson, 100 bags, Eelworm, 18¼ per cent.
„ 19.—Du Toit & De Waal, Middelburg, 40 bags, Eelworm, 13 per cent.
„ 19.—Greyvenstein Bros., Molteno, 20 bags, Eelworm, 5 per cent.
„ 20.—S. Meintjes, Dwaal, 59 bags, Phytophthora infestans, 2½ per cent.
„ 20.—H. T. Jones, King William's Town, 7 bags, Eelworm, 50 per cent.
„ 21.—Bennie & Co., Kimberley, 2 bags, Nectria solani, 7 per cent.
„ 21.—Henry Willie, Grahamstown, 2 bags, Phytophthora infestans, 3 per cent
„ 22.—Knight & Co., Dordrecht, 17 bags, Fusarium solani, 3 per cent.
„ 23.—Slessing, Elliot, 4 bags, Eelworm, 2 per cent.
„ 24.—H. T. Jones, King William's Town, 4 bags, Eelworm, 50 per cent.
„ 24.—R. Gush, Elliot, 63 bags, Eelworm, 3¼ per cent.
„ 24.—Quail Bros., Molteno, 1 parcel, Eelworm, 15 per cent.
„ 24.—Dormer & Neethling, Cathcart, 14 bags, Fusarium solani and Phytophthora infestans, 2 per cent
„ 26.—Cape Orchard Co., Orchard Siding, 20 crates, Eelworm, 1 per cent.
„ 26.—Greyvenstein Bros., Molteno, 57 bags, Eelworm, 5 per cent.
„ 26.—N. D. Deary, Molteno, 25 bags, Phytophthora infestans, 4 per cent.
„ 26.—A. Mosenthal, Port Elizabeth, 20 cases, Fusarium solani, 1¾ per cent.
„ 26.—Dormer & Nebeling, 10 bags, Nectria solani, 1 per cent.
„ 26.—Weintraub, Cape Town, 29 bags, Nectria solani, 4 per cent.
„ 27.—N. D. Deary, Molteno, 25 bags, Phytophthora infestans, 3 per cent.
„ 27.—H. J. van Wyk, Middelburg 15 bags, Eelworm, 6½ per cent.
„ 27.—H. Mackenzie & Co., Molteno, 19 bags, Eelworm, 4 per cent.
„ 28.—N. D. Deary, Molteno, 25 bags, Eelworm, 4 per cent.
„ 28.—N. D. Deary, Molteno, 25 bags, Eelworm, 4 per cent.
„ 28.—J. Mentz, Elliot, 26 bags, Eelworm, 12 per cent.
„ 28.—Friedman Bros., Heidelberg, 100 bags, Eelworm, 3½ per cent.
„ 29.—Greyvenstein Bros., Molteno, 10 bags, Eelworm, 6½ per cent.
„ 29.—Barry & Co., Somerset East, 38 bags, Eelworm, 4½ per cent.
„ 29.—Burmeister & Co., Kubusie, 40 bags, Eelworm, 7½ per cent.
„ 29.—Maister & Shagen, Cape Town, 20 bags, Nectria solani, 1½ per cent.
„ 31.—I. Bosseter, East London, 12 bags, Fusarium solani and Phytophthora infestans, 1½ per cent.

ORANGES.

July 5.—N. Grewar, Loerie, 1 barrel Red Scale, 10 per cent.
„ 10.—Kremer Bros., Kimberley, 2 cases, Mussel Scale, 5½ per cent.
„ 15.—Killerman, Porterville Road, 1 case, Red Scale, 8 per cent.
„ 17.—Rossow, Eendekuil, 3 cases, Red Scale, 11 per cent.
„ 20.—S. Klopper, Laingsburg, 1 case, Red Scale, 23 per cent.
„ 26.—Furter, Wellington, 1 case, Red Scale, 50 per cent.

Apples.

July 2.—Cape Orchard Co., Orchard Siding, 30 cases, Codling Moth, 1 per cent.
,, 19.—Cape Orchard Co., Orchard Siding, 151 cases, Codling Moth, 10 per cent.

Potatoes.

Aug. 2.—N. de Villiers, Kalk Bay, 30 bags, Nectria solani, 1 per cent.
,, 2.—S. A. Burek, Swellendam, 100 bags, Nectria solani, 8 per cent.
,, 2.—A. du Plessis, Tulbagh, 20 bags, Phytophthora infestans, 3 per cent.
,, 6.—Quail Bros., Molteno, 114 bags, Fusarium solani, 1¼ per cent.
,, 7.—H. T. Crouch, Queenstown, 50 bags, Fusarium solani and Phytophthora infestans, 3 per cent.
,, 7.—Quail Bros., Molteno, 80 bags, Eelworm, 3 per cent.
,, 7.—Morum Bros., Tarkastad, 6 bags, Nectria solani, 4 per cent.
,, 7.—C. Poel, Swellendam, 6 boxes, Eelworm and Nectria solani, 25 per cent.
,, 7.—Greyvenstein Bros., Molteno, 31 bags, Nectria solani, 3¼ per cent.
,, 7.—Greyvenstein Bros., Molteno, 11 bags, Eelworm, 11 per cent.
,, 7.—Greyvenstein Bros., Molteno, 60 bags, Eelworm, 5¾ per cent.
,, 7.—Morum Bros., Ugie, 50 bags, Eelworm, 4 per cent.
,, 7.—Atwell, Lady Grey, 41 bags, Eelworm, 3½ per cent.
,, 9.—N. Knorr, East London, 84 cases, Fusarium solani, 1·2 per cent.
,, 9.—Barry Bros., Robertson, 100 bags, Eelworm, 5½ per cent.
,, 10.—E. F. Wylde, Queenstown, 65 bags, Eelworm and Nectria solani, 4½ per cent.
,, 10.—Herssman Bros., Cape Town, 15 bags, Nectria solani, 3½ per cent.
,, 11.—Niekerk, Elliot, 43 bags, Phytophthora infestans and Eelworm, 3 per cent.
,, 11.—J. H. Olivier, Burghersdorp, 29 bags, Phytophthora infestans and Fusarium solani, 1½ per cent.
,, 11.—C. R. Edgar, Burghersdorp, 10 bags, Phytophthora infestans and Fusarium solani, 1¼ per cent.
,, 11.—Malcomess & Co., Cathcart, 150 bags, Eelworm, 9 per cent.
,, 11.—S. J. Fonks, Halseton, 32 bags, Eelworm, 4½ per cent.
,, 11.—Quail Bros., Molteno, 50 bags, Eelworm, 3 per cent.
,, 11.—H. T. Crouch, Queenstown, 55 bags, Nectria solani and Eelworm, 4¼ per cent.
,, 12.—Holden, Somerset East, 25 bags, Eelworm, 2 per cent.
,, 12.—Barry, Ashton, 60 bags, Eelworm, 2¼ per cent.
,, 12.—Dormer & Nebeling, Cathcart, 20 bags, Nectria solani and Phytophthora infestans, 10 per cent.
,, 12.—W. G. Rennie, Cathcart, 100 bags, Eelworm, 7 per cent.
,, 12.—Dormer & Nebeling, Cathcart, 75 bags, Nectria solani and Phytophthora infestans, 7¼ per cent.
,, 13.—Arnowitz Bros., King William's Town, 17 bags, Phytophthora infestans and Fusarium solani, 3 per cent.
,, 13.—Malcomess & Co., Cathcart, 35 bags, Eelworm, 2¼ per cent.
,, 13.—Hogsett, Dordrecht, 56 bags, Eelworm, 5½ per cent.
,, 13.—Morum Bros., Ugie, 60 bags, Eelworm, 9½ per cent.
,, 14.—G. Weaver, Lady Grey, 20 bags, Eelworm, 5 per cent.
,, 14.—A. H. Hoffman, Kimberley, 1 bag, Sterile mycellium, 3 per cent.
,, 14.—Duncan Bros., Queenstown, 70 bags, Phytophthora infestans, 1½ per cent.
,, 14.—Du Toit & Grove, Colesberg, 12 bags, Fusarium solani, 1¼ per cent.
,, 16.—Jacobson Bros., Halseton, 88 bags, Phytophthora infestans, 4 per cent.
,, 16.—Rennie & Co., Cathcart, 40 bags, Phytophthora infestans, 1½ per cent.
,, 17.—G. White & Sons, Port Elizabeth, 20 cases, Nectria solani, 1½ per cent.
,, 17.—Herssmann Bros., Cape Town, 30 bags, Phytophthora infestans, 10 per cent.
,, 17.—D. Steyn, Burghersdorp, 11 bags, Fusarium solani, 4 per cent.
,, 17.—Aronowitz Bros., King William's Town, 18 bags, Nectria solani and Eelworm, 3¼ per cent.
,, 17.—H. T. Crouch, Queenstown, 45 bags, Eelworm, 5¼ per cent.
,, 17.—Dormer & Nebeling, Cathcart, 100 bags, Eelworm, 5¾ per cent.
,, 17.—Aronowitz Bros., King William's Town, 17 bags, Eelworm, 7½ per cent.
,, 19.—Knight & Co., Dordrecht, 35 bags, Phytophthora infestans, 1½ per cent.
,, 20.—Malcomess & Co., Cathcart, 70 bags, Eelworm, 7½ per cent.
,, 20.—Everett & Voster, Lady Grey, 10 bags, Nectria solani and Eelworm, 2½ per cent.
,, 20.—Morum Bros., Queenstown, 60 bags, Nectria solani and Eelworm, 4¼ per cent.
,, 21.—H. Hekma, Cyphergat, 12 bags, Eelworm, 2 per cent.
,, 21.—Berry & Co., Somerset East, 20 bags, Eelworm, 15 per cent.
,, 21.—L. Buirski, Robertson, 100 bags, Phytophthora infestans and Eelworm, 1 per cent.
,, 23.—Fish & Co., Dordrecht, 36 bags, Eelworm, 14 per cent.
,, 23.—J. Devenish, Elliot, 15 bags, Phytophthora infestans, 10 per cent.

Aug. 23.—J. Goldstein, Grahamstown, 1 bag, Phytophthora infestans, 2 per cent.
,, 23.—Station Master, Naauwpoort, 1 bag, Fusarium solani, 5½ per cent.
,, 23.—W. Cooke, Lady Grey, 1 box, Phytophthora infestans, 10 per cent.
,, 24.—Western Fruit Supply, Worcester, 25 bags, Eelworm, 3½ per cent.
,, 25.—Quail Bros., Molteno, 30 bags, Eelworm, 1¾ per cent.
,, 25.—Dormer & Nebeling, Cathcart, 25 bags, Eelworm, 5 per cent.
,, 27.—Dormer & Nebeling, Cathcart, 200 bags, Eelworm, 3 per cent.
,, 29.—H. Ries, East London, 30 cases, Phytophthora infestans, 1¾ per cent.
,, 30.—Barry Bros., Robertson, 5 bags, Eelworm, 6 per cent.; Nectria solani, 1½ per cent.
,, 30.—J. W. Bosman, Worcester, 10 bags, Nectria solani, 4½ per cent.
,, 30.—F. Brink, Triangle, 50 bags, Eelworm, 2 per cent.
,, 31.—N. D. Deary, Molteno, 32 bags, Eelworm, Nectria solani and Tuber Moth, 4½ per cent.
,, 31.—W. T. Supp, Triangle, 70 bags, Eelworm, 3 per cent.

CITRUS FRUIT.

Aug 7.—Bradley, Kimberley, 1 case, Red Scale, 8 per cent.
14.—A. Pringle, Warrington, 1 case, Red Scale, 16 per cent.
15.—P. Russouw, Eendekuil, 1 case Red Scale, 11 per cent.
15.—G. B. Malherbe, Huguenot, 2 boxes, Red Scale, 40 per cent.
15.—J. Goldstein, Grahamstown, 1 case, Red Scale, 5 per cent.; Citrus Rot, 6 per cent.
27.—Smith, Porterville Road, 2 boxes, Red Scale, 8 per cent.
28.—Henry Willie, Grahamstown, 1 box, Red Scale, 13 per cent.

APPLES.

Aug. 10.—S. Cotzias, Cape Town, 50 boxes, Penicillium glaucum, 7½ per cent.

ARTICHOKES.

Aug. 23.—J. D. Logan, Matjesfontein, 1 bag, Rot, 20 per cent.

POTATOES.

Sept. 1.—A. Farr, Bedford, 25 bags, Nectria solani, 1 per cent.
,, 1.—G. R. Jardine, Molteno, 40 bags, Eelworm, 80 per cent.
,, 1.—T. Yazbek, Fort Beaufort, 73 bags, Nectria solani, 5 per cent.
,, 2.—J. Janower, Caledon, 18 bags, Nectria solani, 4 per cent.
,, 3.—E. Cohen, Caledon, 18 bags, Nectria solani, 5 per cent.
,, 3.—M. Hersman, Caledon, 67 bags, Nectria solani, 3 per cent.
,, 4.—Kaplan Bros., Bot River, 22 bags, Nectria solani, 1 per cent.
,, 6.—G. White & Sons, Port Elizabeth, 2 boxes, Phytophthora infestans, 7 per cent.
,, 7.—G. White & Sons, Port Elizabeth, 15 boxes, Phytophthora infestans, 5 per cent.
,, 8.—H. Becker, Aliwal North, 2 bags, Nectria solani and Phytophthora infestans, 12 per cent.
,, 8.—Hersman Bros., Cape Town, 13 bags, Nectria solani, 6 per cent.
,, 9.—J. Saremblock, Triangle, 88 bags, Eelworm, 4 per cent.
,, 10.—Jacobson Bros., Halseton, 100 bags, Eelworm, 3 per cent.
,, 13.—S. J. Fouche, Halseton, 40 bags, Eelworm, 2½ per cent.; 41 bags, Eelworm, 10 per cent.
,, 15.—S. J. Fouchee, Halseton, 60 bags, Nectria solani and Eelworm, 6½ per cent.
,, 15.—Malcomess & Co., East London, 10 cases, Fusarium solani, 8 per cent.
,, 16.—Jacobson Bros., Halseton, 50 bags, Phytophthora infestans and Eelworm, 2·27 per cent.
,, 16.—J. Lawrence, Kimberley, 1 box, Fusarium solani, 15 per cent.
17.—Whitehead & Co., Port Elizabeth, 40 cases, Nectria solani, 3¾ per cent.
24.—J. Lawrence, Kimberley, 1 bag, Tuber Moth, 10 per cent.
27.—Hersman, Cape Town, 4 bags, Phytophthora infestans, 12 per cent.
27.—S. J. Fouchee, Halseton, 50 bags, Eelworm, 8 per cent.
,, 27.—Hersmann, Cape Town, 14 bags, Phytophthora infestans, 3½ per cent.
,, 27.—Richardson, Port Elizabeth, 200 cases, Nectria solani, 17½ per cent.
,, 28.—T. J. Coetzee, Molteno, 52 bags, Eelworm, 5 per cent
,, 30.—Kaplan, Bot River, 17 bags, Nectria solani, 9 per cent.

ORANGES.

Sept. 4.—H. Schmidt & Co., Kimberley, 1 box, Mussel Scale, 22 per cent.
,, 6.—J. Bell, Cape Town, 2 boxes, Red Scale, 15 per cent.

Article	Disease	Extent to which infected by Sample examined. 1 % Con-signments.	1 % Packages.	1 % to 2 % Con-signments.	1 % to 2 % Packages.	2 % to 5 % Con-signments.	2 % to 5 % Packages.	5 % to 10 % Con-signments.	5 % to 10 % Packages.	Above 10 % Con-signments.	Above 10 % Packages.	Sorted. Con-signments.	Sorted. Packages.	Destroyed Con-signments.	Destroyed Packages.	Re-consigned. Con-signments.	Re-consigned. Packages.	Total Rejected. Con-signments.	Total Rejected. Packages.
July, 1909. Potatoes ..	Eelworm ..	2	32	2	104	10	412	9	200	8	268	28	974	1	1	2	50	31	1,025
	Fusarium Solani	1	10	3	52	6	155	3	24	1	8	..	..	.	..	14	249	14	249
	Phy ophthora	..	..	..	..	4	111	..	..	..	.	1	25	.	..	3	86	4	111
	Infestans	.	..	1*	12*	2*	39*												
Oranges ..	Red Scale ..	..	..	..	..	..	..	3	4	3	5	..	..	4	6	2	3	6	9
Apples ..	Codling Moth ..	..	..	1	30	..	..	1	151	..	.	..	..	.	..	2	181	2	181
Total for	July, 1909 ..	3	42	6	186	20	678	16	358	12	281	29	999	5	7	23	569	57	1,575
August, 1909. Potatoes ..	Eelworm ..	1	100	4	117	13	971	11	762	1	73	38	2,019	..	..	1	5	39	2,024
	Fusarium Solani	1	30	7	319	7	191	3	166	..	..	14	546	.	.	4	89	18	635
		..	..	1†	5†	6†	240†	.	.	1†	6†								
	Phytophthora	..	..	5	176	2	108	3	46	.		7	294	1	1	2	35	10	330
	Infestans	..	..	2*	30*	2*	67	2*	95										
	Sterile Mycellium	..	..	..	..	1	1	..	.	..	..	..	..	.	.	1	1	1	1
Oranges ..	Red Scale ..	..	..	..	..	.	.	2	3	4	5	..	..	5	6	1	2	6	8
Lemons ..	Red Scale and Citrus Rot	..	..	..	..	1	1	.	..	.	..	..	..	1	1	..	..	1	1
Apples ..	Pericillium Glaucum	..	.	..	..	..	..	1	50	..		..	.	..	..	1	50	1	50
Artichokes	Rot	..	..	..	..	.	.	.		1	1	..	..	1	1	..	..	1	1
Total for	August, 1909 ..	2	130	16	612	30	1 271	20	958	9	79	59	2,859	8	9	10	182	77	3,050
September, 1909. Potatoes ..	Eelworm ..	..	..	..	..	5	330	3	151	1	40	6	481	..		1	40	9	521
	Fusarium Solani	2	47	..	..	5	216	3	40	3	263	12	505	..	.	1	1	13	506
		..	..	..	..	..	..	1†	66†										
	Phytophthora	..	..	..	..	2	29	1	2	1	4	2	18	.	..	2	17	4	35
	Infestans	..	..	..	..	1†	50†	..	..	1*	2*								
	Tuber Moth ..	..	..	..	..	..	.	1	1	.	..	..	..	..	..	1	1	1	1
Oranges ..	Red Scale ..	..	..	..	..	..	..		.	2	3	.	..	2	3	..	..	2	3
Total for	September, 1909	2	47	..	.	12	575	8	194	7	250	22	1,004	2	3	5	59	29	1,066

CORRESPONDENCE.

Analysis of Colonial Salt.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In the July number of the *Agricultural Journal* (page 23) appears an article, headed "Analyses of Colonial Salt" (by E. V. Flack, Government Analyst).

The article refers to and gives in detail the analyses of twelve samples of salt exhibited at this year's Port Elizabeth Agricultural Society's Annual Show.

It further informs its readers that the samples from Victoria Salt Works, Middlepan, were awarded first prize, and those from the Zwartkops Saltpan Co. second prize. It also refers to the samples submitted by my Company, "The Jacobsdal Saltworks" (Michaelis & De Villiers, Ltd.).

Now the facts stated *as far as they go* are correct, but they require the following *elucidations* and *additional* facts.

The careful reader of the article would have observed that the analyses proved that the samples from our (the Jacobsdal) pan showed the highest percentage of "Sodium Chloride"—the common "Salt" of commerce—but it is not likely the ordinary reader would have examined the details.

Now it seems to us that since the writer of the article was the person to whom the samples were submitted for analysis by the Agricultural Society, he might in fairness to us, have pointed out that the award was not based on the analyses, the more since in his report to the Society he stated : "From the above chemical data, exhibit 'C' (that is our exhibit) appears to be the best. B. and A. *next* in order of *purity*."

As far as the Agricultural Society is concerned, we did not allow the matter to rest with above named awards.

We pointed out to the Society that in its prize list for the show which was to be held at Port Elizabeth on 23rd to 26th March last, the following item appeared on page 15 :—"Salt. 132. Best exhibit of salt, being the direct natural product of a Saltpan, comprising Fine, Medium, and Coarse, each variety not less than 200 lbs. . . . . *Society's Silver Medal....To be judged by analysis.* Exhibits to be in possession of the Society by March 1st, 1909. Entry fee 10s."

This Silver Medal was thereupon awarded to my Company by the Society ,and is now held by us, bearing on one side the inscription : "Awarded to Jacobsdal Salt Works for best exhibit S.A. Salt by analysis." and on the reverse side "Port Elizabeth Agricultural Society Show, 1909."

I may add that it was upon my Company's suggestion that the Society first decided in 1907 that awards for exhibits of salt should be judged by analysis, and we were that year awarded First Prize. I would also point out that in the prize list referred to above (*i.e.* for 1909) no award other than the Society's Silver Medal "*For the best exhibit of salt .. . . To be judged by analysis*" was offered.

If no mention had been made by your contributor as to the *awards made*, the article might have been allowed to pass without comment, as the analyses would then have served as the only and correct guide for readers; as matters stand, however, I trust you will in fairness to my Company insert this letter in the next issue of the *Agricultural Journal*.—Yours, etc.,

THE JACOBSDAL SALT WORKS, LTD.

(MICHAELIS & DE VILLIERS.)

C. A. VIEWEG, Secretary.

Going One Better—Another Hefty Calf.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Though I am loathe to go "One Better," in reply to Mr. B. H. Harris's [illegible] *re* "A Hefty Calf," I had a calf (bull) born here on 7th July last, which [illegible] 99 lbs. at birth. I have not weighed it since. It is by a Friesland bull out of a cross-bred (mostly Ayrshire) cow.—Yours, etc.,

O. C. M. BARRY.

Stellenbosch, November 22.

F

An Old Seedless Orange.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—About forty-five years ago my late grandfather bought the farm Lemoenkraal, in the Division of Bedford, from a Mr. Lotter. There was then, and is there still, an orange tree; the oranges it bears are without exception seedless. Since I have known the tree I have not heard of a single pip being found in any of its fruit. The orange it bears is of medium size, thin peel, a shade darker in colour than other oranges, very sweet, and nicely flavoured. The tree at present is healthy, and there are two layers in the ground made from its lowest branches. My grand father had a tree grown from a layer, from the same tree, in Adelaide; what became of the latter I do not know. Mr. C. Lotter, of Cathcart, remembers the tree, and assures me that it was in bearing for at least two years when Lemoenkraal belonged to his uncle. It now belongs to my aunt.—Yours, etc.,

H. G. VAN NIEKERK.

Bloemhof, Cathcart.

Where the Tortoise goes.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I notice in the October issue of the *Journal* a question by Mr. M. Turner, viz., where does the tortoise go when the water dries up. In reply I can state with certainty that the tortoises live in bushes in the ground; in bushes where the soil is not very hard. As soon as it rains they come to the surface; and as soon as the water dries up the tortoise goes back to his hiding place in the ground. That is the water tortoise.—Yours, etc.,

W. S. TURNER.

Thabies, Gordonia, 16th October, 1909.

Moles in Gardens.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—Could you or any of your readers who know about it from experience, give me advice as to destroying moles in gardens. The mole is almost a pest here; and as this animal is causing me much trouble, I would be obliged by your publishing this letter, together with a reply. Thanking you in anticipation.—Yours, etc.,

C. J. VISAGIE.

De Hoop, Calvinia, November 22.

[Moles may be trapped or poisoned by using as bait the food they mostly prefer. Potatoes are generally effective for this purpose.—*Editor*.]

Reply to Questions, put by "Novice," Peddie.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—In reply to question No. 1 of "Novice," my experience is that such is not the case; sometimes the progeny resembles the mother, and sometimes the father; one observes that also is the case of other animals. As to the section question, I have now in my possession a pair of breeding birds, the male of which is 33 years old, and the female 2 years. As soon as the chickens are hatched I will tell the result. In reply to the third question, it is certain that it is not good to cut the feathers so carelessly as to cause bleeding. The shaft of the feather at the wing is hollow, or there is a hole in it; by cutting too near to the wing, the result will

not only be blood oozing through the little holes; but cold air also penetrates into the bird's wing. I have seen myself in quilling that the cut shaft was full of lice. The best is to cut the feather near to the flue The shaft is not hollow there, so it will not bleed, unless the feather is entirely green.—Yours, etc.,

CARL MEIRING.

Warmwater, Oudtshoorn.

How to Destroy Locusts.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I notice in *Ons Land* of 23rd of October, that Mr. Du Toit, M.L.A., has requested the Government to make the locust poison stronger, for, said he, farmers from Hope Town had written to him that the poison was not sufficiently strong to kill locusts. In my opinion, the poison is sufficiently strong, but it is the farmers who are too weak-hearted. When I started poisoning locusts, I took one part of poison to 60 parts of water; but there was no progress. That day I used 16 bags of forage for a swarm, 1,400 yards in length, and from 150 to 200 yards in width. The next day about one-tenth of the locusts had died. I saw at once that I had to prepare the poison a little stronger (for anyone of common sense can see and know at once what he should do if the poison is too weak). Thereupon I took one part of poison and 43 parts of water, and I can assure all that death was instantaneous. When locusts had become older, I again made the poison stronger, viz., one part of poison to 30 parts of water. I have killed 54 swarms, and I have always succeeded in killing them; never has a swarm removed further from the spot where I poisoned them than say 20 yards. Some people argue that they are afraid to poison locusts, because they might also kill their stock in that way. But if the poison is harmful to stock, I should have seen animals here dying of the poison. I am convinced that it will be only from carelessness if anyone loses an animal through poison. What has to be done is to cut the forage in a forage machine (which any farmer ought to have). Then soak it in the poison, put it on a cart or horse and go to the spot where the locusts are. Sow the cut forage thinly (don't spread it more thickly than wheat is usually sown); in from five to ten minutes all the forage will be devoured, and the little that might have been left is so fine and little that no animal would try and eat it; and usually it is scattered by the wind.

As to the dead locusts, they are excellent fodder; horses, donkeys, cattle, sheep, goats, poultry, in a word almost every living thing devours the dead locusts; and I must say that my horses are in a better condition than before. I would advise every farmer to poison locusts, not only near the lands, but anywhere in the "veld," for we should protect the veld as well as our crops. In my neighbourhood large swarms have been hatched, and when we had rain in September the locusts were swarming everywhere. Four of my neighbours and myself have killed 180 swarms; and if one should ask me to-day where is another swarm, I would not know; as far as I know we have killed all that passed here. But it is regrettable that there are some farmers who do not take an interest in it; for on account of such "remschoenen" we will get an Act to compel us; and that would be a pity, for it will mean expenditure and new taxation. If this season we should say, as one man: "We shall kill locusts," the Government will not legislate in this direction. But it is of no avail that A., B., C. and D. should do their utmost, while the rest do nothing at all. With regard to locusts it is as in the case of scab. There would not have been a Scab Act in our country if all of us had done and were doing our very best. But it is this way, we are obstinate; and as soon as legislation is resorted to, Government gets the blame. As far as I am concerned, they may legislate, and the sooner the better.—Yours, etc.,

P. JOUBERT VILJOEN.

Cypherkuil, Hanover Road, November 16, 1909.

Poisoning Jackals—An Effective Method.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—On page 343 of the September (1909) issue of the *Journal*, appears a letter signed "H. J. Visagie," which is calculated to do much harm. The writer gives a few unconvincing details of his alleged failure to kill jackals when using the

"red poison" supplied by Government. The action of the Government in supplying farmers with strychnine cannot be too strongly approved, and any attempt to prove, on insufficient evidence, that the red poison is ineffective, is as strongly to be condemned. Mr. Visagie appears to have expected to clear the entire country side of jackals by two or three, more or less, amateurish attempts at poisoning them by treating with strychnine the remains of the carcases of sheep they had killed. The fact that he found *one* dead jackal "3,000 yards from where it had picked up the bait," proves that there can have been nothing wrong with the strychnine.

If Mr. Visagie will set about destroying jackals systematically, and will adopt a proper system, he will find the "red poison" as efficient as anyone can desire.

The best method is to cut up raw fat, either suet (binnenfat), body or tail fat, into pieces, more or less rounded, of the size of an average walnut. In each of these, with the narrow blade of a penknife, a hole is made (deep enough to contain the required dose of strychnine) which, after the poison is inserted, is closed up by pressing a small piece of fat tightly into the opening with the knife-blade. Great care should be taken to see that no small particles of poison are left adhering to the outside of the fat, and that the knife blade is carefully wiped after each operation, to prevent the bitter taste of the poison being transmitted to the outside of the baits, as they are being prepared.

When sufficient baits have been prepared, they should be threaded on to a piece of thin stiff wire (like a meat skewer), care being taken not to pass the wire through the centre of the bait, where the poison should be situated. The piece of wire should be long enough to allow of a piece being doubled back, to form a convenient handle by which to carry it. The baits should not be placed on the wire so as to touch, but spaces of half an inch or so should be left between them.

A dead lamb, or offal or carion of any kind is then dragged by means of a reim so as to make a trail ("sleepsel") forming a complete circle around the spot where the sheep lie at night, or the spot where any remains of stock freshly killed by jackals are lying. This method ensures the interception of every jackal coming in from any direction. The size of the circle will depend upon local circumstances, but, as a rule, the bigger it is the better

The wire, with its load of baits, is carried by the man who makes the trail, or by a companion, and near the spot where the first bait is to be laid a fire is lit, and the whole string of baits is carefully roasted (braaied) over the hot coals, or even in the flame, as a scorching seems to suit the taste of the jackal Care should be taken to see that the free end of the wire and all the baits are thoroughly heated, so that the "human taint" left by the handling necessary in preparing the baits is entirely dissipated by the roasting. Unless this is done, none but the most unsophisticated jackals will touch the baits. A bait is now placed on the trail, by pushing it off the end of the wire with a piece of stick It must on no account be touched by the hand, or anything possessing a human taint; a piece of stick freshly picked up off the veld for each bait is best. Care should be taken not to tread upon the trail left by the drag, especially near any of the baits. The baits should be thus placed at intervals of 400 yards or so, all round the circle, and when the trail has been closed, by coming back to the starting point; the "drag" should not be left at that spot, but be removed by carrying it some distance towards home, before throwing it away. The baits should be laid about sundown, too late for any risk of their being picked up by crows or other birds; and before sunrise next morning someone should go right round the circle, and pick up any baits that have not been eaten, and look out for dead jackals, spoors, or other indications that the "lay" has been successful. The baits recovered may be used again if desired, but it is safest to destroy them absolutely by burning them to ashes in a fire.

In making the trail the "drag" should be drawn across any soft spots where spoors can be easily seen, and such spots should, as a rule, be selected for laying the baits, and some simple landmark be noted to aid the memory in finding the spots next morning. A bottle of Government poison can be had for 2s. 6d., and contains, I should say, enough strychnine to poison 500 jackals. Why then pay Messrs. Hayward, Young & Co. or anyone else 5s. for a bottle containing only 50 capsules? The adjusting of the quantity of strychnine for a dose offers no difficulty to anyone of average intelligence, and a little experience will soon indicate whether too much or too little is being used. The distance the jackal may go after taking the bait is really immaterial, as the object is to kill the vermin only.

If Mr. Visagie will carefully follow these directions, and repeat the operation, at intervals of a fortnight or so, for a few months, he will soon experience the advantage of systematic operations, and if he can induce his neighbours to imitate him, even in so thinly populated a district as Van Rhynsdorp, he will be doing the whole country a service.

This letter may seem unnecessarily long, but so many letters on the subject appear from time to time in the *Journal* that I have thought it best to explain fully the method I have found most successful.

The Government poison has over and over again been proved to be thoroughly efficient in this district, and only a few days ago Mr. John Turner, J.P., of "The Glen," a most untiring poisoner, secured a fine tiger by poisoning the carcases of some freshly-hatched ostrich chicks killed by the animal the same day. Mr. Turner, when visiting the nest, had disturbed the tiger in the act of carrying the chicks into a neighbouring bush, but unfortunately was unarmed, and unable to follow the beast.

Have any of your readers had experience of tigers condescending to kill chicks, or is this a new development?

By the way, the circular quoted by you on page 776 of the *Journal* of June, 1908, as accompanying each bottle of "Hulle's Strychnine Capsules," states that these are manufactured solely by "Thomas Whiffen, of Battersea, London, England"; and the "pure strychnine," coloured red, and supplied to us by the Government *is also manufactured by Thomas Whiffen*, and is doubtless the same identical article from which the capsules are made.—Yours, etc.,

ROOI GIFT.

Hay, C.C., November, 1909.

Sheep Dipping Tanks.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—I intend building a dipping tank shortly, but am undecided which tank is most suitable (the long, or the circular with pillar in centre).

The tank is required on a farm running between 2,000 and 3,000 sheep.

Could you or any readers of the *Journal* give me information on the following:—

(1) Which is the most suitable tank?
(2) In either case, what dimensions?
(3) What slope ought I to give the exit?
(4) Should the tank be wider at top than bottom?
(5) Which is the more tiring to sheep—the circular, where they are kept continually swimming; or the long tank, in which they climb on one another?

C. P. DE VILLIERS.

Beaufort West, November 6, 1909.

[The Chief Inspector of Sheep replies: The following is the information sought:—

(1) The circular form of tank is the most suitable for all purposes.
(2) The dimensions are as follows: Diameter at top, 4 ft. 9 ins.; diameter 6 ins. from top, 5 ft.; diameter 12 ins. from bottom, 3 ft. 6 ins.; depth, 5 ft.
(3) The outlet should be made so that sheep can walk out without difficulty.
(4) Answered in (2).
(5) The circular tank may be more tiring to sheep in one way, but infinitely better work is done, as the sheep are moving all the time, and thus the dipping mixture penetrates to the skin.

The tank should be in the form of an ordinary soap pot without any pillar in the centre; the fact that the diameter at top is three inches narrower than it is six inches lower, allows the water to fall back into tank whilst dipping is in progress, instead of splashing over the side as would be the case if the tank were five feet diameter at top. You will find this form of tank very much superior in every way to the long narrow tank. Any further particulars can be supplied if necessary.]

Grasses for the Western Province.

To the Editor, AGRICULTURAL JOURNAL.

SIR,—By publishing this letter in the *Agricultural Journal* you will oblige me and perhaps many of my neighbours. The Government takes pains and expense annually in distributing grass and other seeds to farmers for experimental purposes.

It is four years since I removed from the Free State to this place. And since that time I have tried to plant grass on a large scale. I started the first year with *Paspalum dilatatum*. I have spared no expense. I received also a parcel of seed from the Government, and from Australia 100 lbs. I cultivated and worked a large and fertile plot of land, and put in Paspalum plants in September, and sowed also part of it with seed. The rains that year were also favourable. It thrived well. But the rainy season being past, the grass stopped growing (it not being under irrigation). Now after three years it is partially withered, and partially not good enough for pasture. Many of my neighbours have been disappointed in the same way. We in the Western Province are now convinced that Paspalum does not agree with our dry summer season. I and others also have small plots under irrigation or sown in moist vlei ground, which answers well as long as it has moisture. But as a pasturage it is sometimes impossible to irrigate. It is not good enough to sow a small bed and keep it under irrigation, and then to report to Government that it does splendidly. I am certain that this grass will answer much better in the "onderveld" with its summer rains, if frosts don't injure it. Paspalum is a good fodder for all stock. Having condemned Paspalum for our Western Province, I wish to suggest a few grasses, which in my experience will answer well in our district.

No. 1 is Blue Seed grass, which, if sown in August, and established by the spring rains, will endure the summer well and give a good pasture. (This is a perennial grass.) To my regret the Government sent this seed this season only towards the end of October, the rains being over.

No. 2 is Tall Fescue, *Festuca elatior*. This grass comes next to Blue Seed grass, but is also best, if sown early in August. Stands drought better than Paspalum.

No. 3 is *Phalaris commutata*. This is a grass which in moist soil grows to a height of six feet. One of the most succulent grasses I have under experiment. The seed is not yet to be had in large quantities; but the grass soon yields seed itself. Last year I paid £1 for one ounce.—Yours, etc.,

A.H.S.

Klein Drakenstein, November 6, 1909.

NOTES ON THE WEATHER OF OCTOBER, 1909.

By CHARLES M. STEWART, B.Sc., Secretary to the Meteorological Commission.

Changeable weather, cold and heat alternating during the month, but with both day and night temperatures about one degree lower than the normal; mean barometric pressure slightly higher than usual; a rainfall of greater depth than usual in West and South, but deficient in the East and interior; severe frosts, causing considerable damage to fruit, etc; unusually strong, cold westerly and south westerly winds; an increased number of thunderstorms, with occasional hail; some snow and sleet; a high percentage of cloud, with a decreased fog frequency, were the most noteworthy points in connection with the weather of October, 1909.

DIVISION.	Mean Rainfall (1909).	Mean No. of Days.	Average Rainfall (1891-1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	3·64	10	2·78	8	+0·86	+ 31
South-West ...	3·18	9	1·73	6	+1·45	+ 84
West Coast ...	1·56	5	0·80	4	+0·76	+ 95
South Coast ...	3·42	10	2·26	8	+1·16	+ 51
Southern Karoo ...	2·07	7	0·91	4	+1·16	+127
West Central Karoo ...	0·63	3	0·62	2	+0·01	+ 2
East Central Karoo ...	0·42	2	0·66	3	−0·24	− 37
Northern Karoo ...	0·25	2	0·78	2	−0·53	− 68
Northern Border ...	0·17	1	0·62	2	−0·45	− 73
South-East ...	1·84	7	2·45	8	-0·61	25
North-East ...	0·52	4	1·51	4	−0·99	66
Kaffraria ...	0·77	6	2·64	8	−1·87	− 71
Basutoland ...	1·44	4	2·34	6	−0·90	− 38
Orange River Colony...	...	.	1·42	3	...	...
Durban (Natal) ...	2·11	11	4·46	...	−2·35	− 53
Bechuanaland ...	0·03	1	1·04	4	−1·01	− 97
Rhodesia ...	1·12	3	0·72	3	+0·40	+ 56

Precipitation.—Mean precipitation during October deduced from 365 stations amounted to 1·54 ins. on 6 days, being 0·28 ins., or 15 per cent. below the normal. This amount is 0·37 ins. less than that for September last, and 1·16 ins. below the mean for October of 1908. Compared with last month, there has been an increase in the amounts registered over the Cape Peninsula, West Coast, South Coast, Southern Karoo and Rhodesia, but a considerable decrease over the other areas; whilst on comparing the divisional means with those for the corresponding month of last year, the Cape Peninsula is found to have practically the same amount, but an increase is shown by the South-West, West Coast, Southern Karoo, Northern Border and Rhodesia, with diminished amounts elsewhere. From the accompanying table, it may be seen that those sections in the West and South, together with Rhodesia were in excess of the normals, the surplus ranging from 127 per cent. over the Southern Karoo to 2 per cent. over the West Central Karoo; the deficits over the other divisions ranged from 97 per cent. in Bechuanaland to 25 per cent. in the South-East. On summarising the totals for the month, it is found that of 365 stations, 37 had "nil" and 97 had 0·01—0·50 ins., showing that about 37 per cent. suffered

from absolute or partial drought. Of the remainder, 55 had 0·51—1·00 ins.; and an equal number had 1·01—2 ins; 53 had 2·01—3 ins; 35 had 3·01—4 ins.; 12 had 4·01—5 ins.; 8 had 5·01—6 ins.; 6 had 6·01—7 ins.; 3 had 7·01—8 ins.; leaving four (4) with over 8 ins., viz., Witte Els Bosch, 8·08 ins.; Buffel's Nek, 8·28 ins.; Ceres, 8·42 ins.; and with Evelyn Valley with 8·51 ins., as the maximum for the month. The maximum amounts recorded in 24 hours were nowhere exceptionally great, the largest total for one day being 3·30 ins. at Witte Els Bosch on the 17th; in only three other cases did it exceed two inches (2 ins.), viz., Ceres, 2·75 ins. on 27th; Evelyn Valley, 2·28 ins. on 17th; and Buffel's Nek, 2·20 ins. on 14th. Of the rest of the 354 stations supplying the necessary data, 210 had nil to 0·50 ins.; 95 had 0·51—1·00 ins.; and 49 had 1·01—2 ins. *Thunderstorms* were almost twice as numerous as during September, but slightly under the number for the previous October, 164 instances being noted on 27 days; on most of these days the storms were very limited in distribution, but were much more widespread on 11th, 26th, and 27th. *Hail* was noted as falling at 20 stations on 11 days, principally 11th and 27th. The only damage reported was caused at Van Rhyn's Dorp by that on 27th, when fruit crops were affected. *Snow* was reported from Cala on 13th, Hogsback on 17th, 18th, and 19th, and Lauriston on 18th, and *Sleet* from six stations on the same dates.

Temperature, Cloud, and Wind.—The mean temperature of all stations was 60·2°, being only 0·9° above that for the previous month, and 0·2° higher than that for the corresponding month of 1908. The mean maximum (70·7°) was 0·6° above that for October of last year, and 0·8° above that for the preceding month; while the mean minimum (49·7°) was 1·1° higher than in September last, but 0·2° lower than the previous October. The mean daily range, 21·0°, was 0·8° more than during September. Compared with the normals, the mean monthly temperature was 1·0° less than usual, the deficit being almost equally divided between the days and the nights, 1·1° being due to the former, and 0·9° to the latter. At the individual stations the mean monthly temperature was below the average by 1½ to 4 degrees in the West, South-West, and chiefly by 0·5—2 degrees in the South-East, South and interior; stations in Kaffraria, however, showed a slight excess of temperature over the averages, varying from 0·1° at Main to 1·8° at Umtata, whilst there were also slight excesses at Stutterheim and Hopefountain (Rhodesia). The mean maximum temperatures were also higher than usual at the stations in Kaffraria, and at a few in the South-East and interior, the excess ranging from 3·6° at Umtata to 0·3° at Stutterheim, but were below the normal elsewhere, mostly by 2—4 degrees, the deficits ranging, however, from 4·8 at Amalienstein and Heidelberg to 0·0° at Port Elizabeth. Similarly the mean minimum temperatures were mostly below the averages by about one degree, the amounts ranging, however, from 0·1° at Hopefountain and Stutterheim to 4·4° at Hanover; at a few stations, however, principally in Kaffraria, at or near the coast, and at Kimberley there were small excesses, the greatest being 2·6° at Main. The unusual coolness of the month, particularly in the Cape Peninsula and South-West, is shown by the fact that at almost all stations there the monthly temperatures were lower than those for September by amounts varying from 0·2° (at Cape Town) to 3·2° (at Disa Head), whilst a similar state of affairs is to be found at one or two stations on the South and West coasts. The mean warmest station was Mochudi (71·2°), and the mean coolest Disa Head (49·3°), a difference of 21·9°. The highest mean maximum (89·6°) is shown by Mochudi, and the lowest mean minimum (38·1°) by Hanover. The highest readings of the month were registered principally during two warm spells, 9th to 11th, and 21st to 24th, chiefly on the 21st, although a few were also recorded on five other days of the month. The lowest readings occurred on 17 days: 1st, 2nd, 4th to 8th, 14th, 15th, 18th to 20th, 23rd, 24th, 28th, 30th and 31st, most widely on the 15th and principally during the preceding fortnight. The mean of the highest readings (85·3°) was 1·8 lower than the previous month, and 0·9 less than the similar value for October of last year, whilst the mean of the lowest readings (39·9°) was 2·7° higher than the preceding month, but 0·5° lower than the corresponding month of last year. The mean monthly range was 45·4°. The extreme readings for the month were 101·0° at Mochudi on the 22nd (Main coming next with 100·5° on 22nd), and 26·5° at Aliwal North on 7th, an extreme monthly range of 74·5°. *Frosts* were unusually numerous and severe, causing considerable further damage to fruit in the East and North-East, as well as injuring veld, crops, and vegetables. Altogether 41 instances of its occurrence were reported on 18 days, being slightly above the number noted in September, and more than double the number in October, 1908; they were most numerous on 6th and 7th, but were noted on 1st to 8th, 13th to 15th, 17th to 20th, and 28th to 30th. At Retreat (Cape Peninsula) the grass minimum showed a mean of 45·2°, or 6·3° below the shade minimum; the temperature fell to 31·7° on the 2nd, the only instance of its falling to or below the freezing point during this month, and was at the maximum of 57·2° on 12th.

The mean amount of *Cloud* was unusually high, being 51 per cent., or 5 per cent. more than last month, although 2 per cent. less than in October of last year. It

was fairly uniform in distribution throughout the Colony, being 50 to 70 per cent. along the coast and at stations a considerable distance inland, and decreasing to 30—40 per cent. or over in the interior. It varied in amount from 23 per cent. at Kuruman to 78 per cent. at Dunbrody. *Fogs and Mists* were mostly comparatively local and much less numerous than during either the preceding month or the previous October; the number reported (88) as occurring on 28 days is less than half that for October, 1908, and only about two-thirds that for the immediately preceding month. This phenomenon was most numerously reported on 30th, 29th and 25th. No fog was noted on 7th, 15th, and 21st. The prevailing morning *Winds* were southerly (S.E. to S.W.) in the West and South-West, and westerly (N.W. to S.W.) elsewhere, except at Hopetown, where they were easterly, Kokstad and Mochudi where they were north-easterly, Hopefountain where they were south-easterly, whilst at Kimberley northerly and south-westerly winds were equally frequent. The mean *Wind Force* was 2·50 on the Beaufort Scale, corresponding to a mean velocity of 15·5 m. per hour, being 1·75 m. per hour more than during the previous October, and 2·05 m. per hour more than during the preceding month. The mean force was greater than usual over all sections of the country, being strongest in Kaffraria, the West and South and attained a mean velocity of 20·5 m. per hour even at Hopefountain in Rhodesia. At the Royal Observatory the mean velocity was 14·15 m. per hour or 2·45 m. per hour greater than usual. Although the prevalent direction there was southerly, these winds were about 8 per cent. less in evidence than usual, whilst those from directions between S.W. and W.N.W. were also in defect or entirely absent. There was an excess, however, of winds from N., N.W., S.S.W., S.S.E., S.E. and E., as well as of calms, mostly of 3—4 per cent. Strong winds and *Gales* were much more frequent than during the previous month, being reported as attaining this strength from 51 stations on 16 days, 1st, 5th, 6th, 11th to 14th, 16th to 19th, and 25th to 29th, but most widely on 17th and 27th. *Hot Winds* occurred at 6 stations on 6 days, and *Duststorms* on 3 days at an equal number of stations. *Earthquake Shocks* were experienced at Anenous on 7th, and Kokstad on 19th.

OBSERVERS' NOTES.

Vruchtbaar (Wellington).—Rainfall above the average for several years. All varieties of fruit promise well, except late apricots. Vines very good, and coming grape crop will be a full one.

Anenous.—Earthquake shock felt at 11.15 p.m. on 19th. Loud, rumbling noise, moving apparently from West to East. Duration two minutes, slight vibration.

Plettenberg Bay.—Country looking beautiful. Crops promising.

Sunnyside (Uitenhage).—Crops very promising

Uitenhage Park.—Rainfall considerably below the average of eight years (1901-8). Much wind and low temperature.

Roode Hoogte (Middelburg).—Only 1·10 ins. of rain fallen here during the last five months. Rain badly needed.

Schuilhoek (Hanover).—High winds and duststorms prevalent during month. Fruit will be a negative quantity. Locusts numerous in parts—good work being done with Government mixture.

Theefontein (Hanover).—Weather during this month can only be described as execrable, changing from Arctic to tropical and back again every week with unfailing regularity. High cold winds prevailed, ranging from N. to S.W. Frosts occurred on 7th, 8th, 15th, 19th, 20th, 28th and 29th. N.W. gale on 27th. Rain wanted! When is it not in the Karoo? Hopper locusts appeared all over the district, some farmers making strenuous efforts to destroy them with the free Government poison. Very little damage to crops so far.

Varken's Kop (Middelburg).—A month of variable winds, northerly, followed by W., S.W. and S. Frost on the 18th.

Sunnyside (Hay).—The weather has been very changeable throughout this month, and the late frosts have done considerable damage to fruit trees, etc.

Huxley Farm (Stutterheim).—The shortfall of rain is most serious; young grass drying and springs giving up. Most unusually hot at times, and very cold high winds are making things most unpleasant both for man and beast.

Clifton (Sterkstroom).—Rain badly needed for crops and veld. Veld badly burnt by frost. Half fruit crop killed by frost. Stock doing well.

Sunnymeade (Albert).—An exceptionally bad month. Lots of cold wind and heavy frosts. Crops have and are suffering considerably. Rain is badly needed. Stock doing well.

KOKSTAD.—Rain badly wanted. Very cold easterly winds during month. Frost on 13th and 14th.

MT. FLETCHER.—This is the first time since 1900 that no rain has been recorded at this station. We have had wind almost every day.

SLAATE.—This month has been remarkable for excessive and variable winds and rapid changes of temperature.

TENT KOP (Maclear).—Very dry for the season of the year, and a very cold month. Frost more or less severe nearly half the nights this month.

NOTTINGHAME (Mafeking).—Weather has been unusually cool this month. Cold winds from S. have been prevalent.

GROOT DRAKENSTEIN (Paarl).—This month was unusually wet and cold, the temperature being 0·2° below that of last month. Mean temperature of month, 1·4° below average (10 years); maximum, 1·9° below average (10 years); rainfall, 1·30 ins. above average.

UMTATA.—General. Rainfall 0·26 ins. below average. Weather generally most unseasonable and changeable. Strong winds prevalent. *Crops.*— Owing to drought forage crops are poor; harvest has just commenced. Grubs and other vermin are destroying vegetables, etc. Country very dry: farmers unable to plough. Rain is badly needed. During month several storms passed over neighbouring districts.

KOKSTAD (Cape).—Very changeable weather from heat to cold. Gales have been numerous, but very little rain fell. Farmers are complaining of drought. A couple of earthquake shocks were felt on the afternoon and evening of the 7th. Fruit and vegetables have been damaged by frost.

CARNARVON FARM.—This has been the worst October recorded during the last ten years. Twenty-three windy days (gales most of the time) are quite unprecedented. Frosts, though somewhat below the average, were disastrous all the same, and in most parts finished the wreckage caused by the "Aurora" frost of the 25th ultimo. As will be seen by the subjoined table, the rainfall is near ¼ in. below the average; but the ·75 recorded on the 11th was purely a local storm. Waters are getting scarce. Locusts: None near enough to reach these parts from the West during the hopping stage. Lucerne: Not doing well about here. It was kept in a semi-withered condition from the 25th September to the middle of this month. Parasites of every description are keeping it a month or two back. Some lands have "root rot." It is most unfortunate that this blue-blooded aristocrat of all fodder plants should fail to maintain its title. Lambing season exceptionally good. Everywhere cattle doing well; horses ditto, though drought severe, and now irrigable lands going to the dogs. Grubs and fly are destroying threequarter of crops before or as they come up.

1901	2·37	6	4	0
1902	0·66	9	5	2
1903	0·92	21	7	0
1904	1·02	16	9	0
1905	1·30	12	3	4
1906	2·63	8	8	0
1907	0·22	17	12	0
1908	1·18	14	6	2
1909	1·04	23	8	0
Means	1·26	14	7	1

TEMPERATURE, OCTOBER, 1909.

Stations.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory ..	66·7	52·2	59·4	82·5	21	41·2	2
Cape Town (S.A.O.) ..	67·8	52·3	60·0	87·0	10	46·0	15
" (City Hospital) ...	66·5	52·3	59·4	81·0	21	46·0	15
Table Mountain (Disa Head)	55·0	43·6	49·3	72·0	21	36·5	6
Do. (Devil's Peak)	60·5	45·6	53·0	79·0	21	39·0	6
Blaauwberg ..	65·0	52·2	58·6	77·0	10	46·0	14
Wynberg ..	67·8	50·4	59·1	79·5	21	44·5	2, 4 & 14
Groot Constantia ..	64·6	50·3	57·4	77·0	21	45·0	4
Bishopscourt ..	65·1	47·7	56·4	78·0	21	41·0	14
Retreat ..	66·8	51·5	59·2	78·5	21	41·6	2
Simon's Town ..	65·9	54·3	60·1	78·0	21	49·0	4 & 6
Danger Point ..	62·9	53·9	58·4	70·0	21	48·0	31
Groot Drakenstein ..	69·7	49·7	59·7	87·8	21	40·0	2
Elsenberg (Agri. College) ..	66·7	47·9	57·3	84·3	10	40·0	30
Robertson Plantation ..	72·2	49·0	60·6	87·0	11	38·0	1
Malmesbury ..	70·0	48·6	59·3	88·4	10	39·0	2
Port Nolloth ..	63·2	48·1	55·6	70·0	28	42·0	2
O'okiep ..	71·9	48·3	60·1	90·0	9 & 10	38·6	1 & 6
Mossel Bay ..	67·8	53·1	60·4	77·0	11	44·0	15
Heidelberg ..	71·4	50·7	61·0	92·0	11	40·0	5
Cape Agulhas ..	64·5	53·1	58·8	72·0	5	47·0	2 & 30
Port Elizabeth ..	68·3	54·5	61·4	85·0	11	48·0	15
Cape St. Francis ..	65·5	54·1	59·8	69·0	9, 10 & 26	48·0	8, 20 & 31
Dunbrody ..	77·9	50·3	64·1	98·2	11	35·7	15
George (Plantation) ..	65·2	50·0	57·6	88·0	11	42·5	15
Amalienstein ..	73·7	47·9	60·8	91·0	11	39·0	7
Hanover ..	76·3	38·1	57·2	86·0	11	27·0	15
Murraysburg ..	73·5	44·3	58·9	89·0	23	32·0	6
Kimberley ..	82·8	52·2	67·5	95·0	24	39·1	28
Cathcart ..	71·1	43·8	57·4	85·5	22	32·9	15
Stutterheim ..	71·3	49·4	60·4	91·1	22	37·0	7
Sy ..	70·5	48·9	59·7	90·0	11	32·0	18
..	70·4	56·6	63·5	78·0	29	49·0	7 & 15
Lovedale ..	75·9	49·1	62·5	97·0	22	39·0	7
Evelyn Valley ..	65·9	44·6	55·2	82·0	22	32·0	2
Chiselhurst ..	78·4	51·2	66·3	89·0	11	45·0	5
Aliwal North ..	77·6	44·1	60·8	90·5	23	26·5	7
Rietfontein (Aliwal N.) ..	72·0	43·6	57·8	85·5	24	30·1	7
Tabankulu ..	73·4	49·9	61·6	90·5	26	35·0	15 & 20
Umtata ..	77·4	50·6	64·0	95·0	26	36·0	7
Kokstad ..	72·6	45·3	59·0	92·0	24	32·0	15
Port St. John's ..	74·0	57·9	66·0	84·0	29	48·0	15
Main ..	71·2	51·0	61·1	100·5	22	35·5	20
Kuruman ..	81·7	42·0	61·8	92·0	24	32·0	24
Mochudi ..	89·6	52·9	71·2	101·0	14	38·0	19
Hopo Fountain ..	84·3	57·1	70·7	95·8	28	49·8	23
Means ..	70·7	49·7	60·2	85·3	...	39·9	
Extremes ..	...	...	...	101·0	14	26·5	7

RAINFALL, OCTOBER, 1909.

I. CAPE PENINSULA :

	INS.
Royal Observatory (a) 12in. gauge	2·30
Cape Town, Fire Station	3·15
Do. South African College	3·11
Do. Molteno Reservoir	2·95
Do. Platteklip	4·13
Do. Signal Hill	2·06
Do. Hospital	2·01
Sea Point, The Hall	2·30
Camp's Bay	2·45
Table Mountain, Disa Head	3·07
Do. Kasteel Poort	5·66
Do. Waai Kopje	6·50
Do. St. Michael's	6·54
Devil's Peak, Blockhouse	4·69
Do. Nursery	3·36
Do. Lower Gauge	
Woodstock (The Hall)	2·83
Do. (Municipal Quarry)	3·48
Do. (Do. Nipher's shield)	3·54
Newlands, Montebello	5·11
Kenilworth	3·08
Wynberg, St. Mary's	3·64
Groot Constantia	4·09
Plumstead, Culmwood	2·77
Muizenberg (St. Res.)	4·47
Simon's Town, Wood	3·27
Cape Point	0·96
Blaauwberg Strand	1·34
Robben Island	1·17
Maitland Cemetery	2·89
Tamboers Kloof	2·69
Woodhead Tunnel	4·91
Lower Reservoir	3·14
Maclears Beacon	7·74
Waai Vlei	7·51
Woodhead Dam	5·90
Retreat	2·76

II. SOUTH-WEST :

Eerste River	1·97
Klapmuts	3·68
Stellenbosch, Gaol	3·67
Somerset West	2·82
Paarl	3·88
Wellington, Gaol	3·54
Groot Drakenstein, Weltevreden	4·19
Porterville Road	3·39
Tulbagh	3·09
Kluitjes Kraal	3·16
Ceres	8·42
Rawsonville	2·19
Caledon	3·47
Worcester, Gaol	1·54
Hex River	2·57
Karnmelks River	2·80
Lady Grey, Div. Robertson	1·09
Robertson, Gaol	2·19
Do. Govt. Plantation	2·04
Montagu	3·07
Danger Point	2·59
Elgin Plantation	5·28
Elsenburg Agricultural College	3·17
Roskeen	2·25
Vruchtbaar	3·98

III. WE

	INS.
Port Nolloth (Lieut. Barber)	0·15
Anenous	0·30
Klip	0·31
O'okiep	0·28
Springbokfontein	0·42
Concordia (Krapohl)	0·86
Van Rhyn's Dorp	1·24
Clanwilliam, Gaol	0·83
Dassen Island	1·10
The Towers	2·04
Malmesbury	2·42
Piquetberg	3·65
Hopefield	1·08
Algeria (Clanwilliam)	4·46
Ceda (do.)	5·46

IV. SOI

Cape	1·93
Bred	2·15
Swel	4·84
Potb	2·28
Grootvaders Bosch	6·39
Heidelberg	2·01
Riversdale	4·15
Vogel Vlei	2·19
Mossel Bay	2·24
Great Brak River	1·34
Geor	2·89
Dc (Plantation)	2·77
Woodifield (George)	3·82
Concordia	6·78
Buffel's Nek	8·28
Plettenberg Bay	3·48
Harkerville	6·49
Witte Els Bosch	8·08
Humansdorp	2·91
Cape St. Francis	2·28
Witteklip (Sunnyside)	3·82
Uitenhage (Gaol)	1·26
Do. (Park)	1·09
Armadale (Blue Cliff)	1·17
Dunbrody	1·27
Port Elizabeth (Harbour)	84
Do. (Victoria Park)	99
Do. (Walmer Heights)	93
Centlivres	09
Edinburgh (Knysna)	61
The Slip, Port Elizabeth	3·55

V. SOUTHERN KAROO :

Ladismith	2·62
Amaliehstein	1·87
Oudtshoorn	1·89
Vlaakte Plaats	1·57
Uniondale	2·39

VI. WEST-CENTRAL KAROO :

Fraserburg Road	0·31
Prince Albert	0·44
Zwartberg Pass	4·60
Beaufort West, Gaol	0·20
Dunedin	0·23
Nel's Poort	0·00

VI. WEST-CENTRAL KAROO: *contd.*	INS
Krom River	0·07
Roos Plaats	0·10
Lemoenfontein	0·26
Baakeu's Rug	0·09
Willowmore	1·35
Rietfontein	0·10
Steytlerville	0·41

VII. EAST-CENTRAL KAROO.	
Aberdeen Road	0·15
Kendrew, Holmes	0·14
Do.	0·35
Graaff-Reinet, Gaol	0·44
Do. (Eng. Yard)	0·43
New Bethesda	0·25
Roodebloem	0·20
Glen Harry	0·49
Wellwood	0·13
Do. Mountain	0·38
Bloemhof	0·47
Jansenville	0·16
Bethesda Road	0·00
Roode Hoogte	0·33
Toegedacht	0·32
Klipfontein	0·22
Pearston	0·79
Middlewater	1·48
Somerset East, Goal	1·38
Spitzkop (Graaff-Reinet)	0·41
Grobbelaar's Kraal	0·41
Zeekoe River (Aberdeen)	0·11

VIII. NORTHERN KAROO:	
Calvinia	0·66
Sutherland	0·86
Fraserburg	0·10
Scorpions Drift	0 00
Carnarvon	0·00
Brakfontein	0·29
Victoria West	0·05
Doorskuilen	0·00
Britstown	0·00
Wildebeestkooij	0·00
Murraysburg	0·15
De Kruis, Murraysburg	0·00
Richmond	0·16
Hanover	0·10
Theefontein	0·02
The Willows (Middelburg)	0·00
Colesberg	0·15
Varkens Kop	0 17
Culmstock	0·03
Droogefontein	0·00
Cradock (Gaol)	0·48
Witmoss	0·58
Maraisburg	0·00
Steynsburg (Gaol)	0·18
Tarkastad	0·84
Waverley	0·36
Montagu	0·60
Schuilhoek	0·09
Vosburg	0·00
Zwavelfontein	0·00
Bultfontein (Colesberg)	0·00
Hartebeestefontein	0·18
Willow Walk (Tarkastad)	1·31
Hotweg Kloof (Cradock)	1·05
Loeriesfontein	0·83
Thebus Waters	0·03

IX. NORTHERN BORDER:	INS.
Kenhardt	0·08
Upington	0·00
Trooilapspan	0·00
Van Wijk's Vlei	0·00
Prieska	0·00
New Year's Kraal	0·00
Dunmurry	0·00
Karree Kloof	0·00
Griquatown	0·00
Douglas	0·00
Hope Town	0·00
Newlands, Barkly West	0·02
Barkly West	0·86
Kimberley Gaol)	0·95
Do. Stephens	0·82
Strydenburg	0·00
Rietfontein (Gordonia)	0·00
Douglas (Vos)	0·00
Stoffkraal (Div. Prieska)	0 00
Rocklands (Barkly West)	0·52

X. SOUTH EAST:	
Melrose (Div Bedford)	0·61
Dagga Boer	0·58
Alicedale	1·12
Bedford (Gaol)	2·03
Sydney's Hope	2·23
Adelaide	2·07
Atherstone	3·09
Alexandria	3·31
Fort Fordyce	3·57
Graham's Town (Gaol)	3·22
Heatherton Towers	0·89
Sunnyside	2·97
Fort Beaufort	1·77
Katberg	3·65
Seymour	1·74
Glencairn	5·08
Lovedale	2·09
Port Alfred	1·07
Hogsback	5·20
Peddie	1·12
Exwell Park	0·21
Keiskamma Hoek	1·59
Cathcart (Gaol)	0·65
Cathcart (Forman)	0·63
Cathcart	0·76
Thaba N'doda	2·42
Evelyn Valley	8·51
Crawley	0·18
Thomas River	0·60
Perie Forest	2·47
Isidenge	3·22
Kologha	2·27
King William's Town (Gaol)	0·56
Stutterheim (Bousfield)	1·72
Fort Cunynghame	0·80
Dohne	0·74
Kubusie	2·98
Quacu	0·59
Bolo	0·38
Fort Jackson	0·52
Komgha (Gaol)	1·07
Chiselhurst	1·87
East London West	2·28
Cata	1·53
Wolf Ridge	3·25
Dontsah	2·61
Mount Coke	0·60
Blackwoods	2·55

X. SOUTH EAST (*continued*)

	INS.
Albert Vale (near Bedford)	1·27
Huxley Farm, Stutterheim	0·36
Amabele Junction ...	1·75
Howe (Cathcart)	0·93
Izileni (King Wms. Town)	1·00

XI. NORTH-EAST:

Venterstad	0·65
Mooifontein	0·57
Burghersdorp (Gaol) ...	0·35
Ellesmere	0·25
Oyphergat	0·30
Thibet Park	1.10
Sterkstroom (Station) ...	0·15
Aliwal North (Gaol) ...	0·71
Poplar Grove	0·84
Carnarvon Farm	1·04
Jamestown .. .	0·31
Whittlesea	0·28
Queenstown (Gaol)	0·36
Rietfontein (Aliwal North)	0·83
Middlecourt	0·47
Dordrecht	0·36
Herschel	0·63
Lady Grey	0·78
Lauriston	1·11
Lady Frere	0·41
Contest (Near Bolotwa) ...	0·36
Keilands	0·09
Barkly East	1·10
Cliftonvale	0·51
Hughenden	0·45
Glenwallace	0·58
Indwe (Collieries)	0·29
Hopewell (Imvani) ...	0·00
Sunnymeade (Div. Albert)	0·35
Clifton (Sterkstroom) ...	0·34

XII. KAFFRARIA.

Ida (Xalanga)	0·6
Slaate (Xalanga)	0·6
Cofimvaba	0·4
Tsomo	0·2
N'qamakwe	0.7
Main	0·3
Engcobo	0·8

XII. KAFFRARIA (*contd.*)

	INS.
Woodcliff	1·09
Kentani	1·01
Maclear	0·31
Idutywa	0·15
Bazeya	1·55
Willowvale	0·97
Mount Fletcher	0·00
Somerville (Tsolo)	0·08
Elliotdale	0·40
Umtata	0·26
Cwebe	1·19
Tabankulu	0·34
Kokstad	0·88
Do., The Willows	0·91
Flagstaff	1·00
Insiken.	1·41
Port St. John's	2·18
Umzimkulu	0·57
Wanstead	0·41
Cedarville	1·48
Maclear (Station)	0·50
Tabankulu (Atkins) ..	0·41
Umzimkulu (Strachan) ...	1·01
Tent Kop (Elands Height)	0·86
Elton Grange (Mount Currie	1·11

XIII. BASUTOLAND:

Mafeteng	1·57
Mohalies Hoek	1·88
Maseru	0·90
Qacha's Nek	1·3

XIV. NATAL:

Durban, Observatory .	2·1

XV. BECHUANALAND

Taungs	0·1
Vryburg	0·0
Mafeking	0·0
Setlagoli	0·0
Kuruman	0·0
Nottinghame (Mafeking) ...	0·0
Masilibitsani	0·0

XVI. RHODESIA

Hopefountain ...	1.1

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*Lamziekte on the Kaap Plateau each	0	3
*Mule Breeding, Notes on .. each	0	3
Miltziekte en Varkenkoorts, Preventieve Inenting tegen	0	3
Miltziekte en Sponsziekte	0	3
*Osteo-Porosis . . . . each	0	3
Redwater in Cattle	0	3
*Redwater, Preventive Inoculation for .. .. each	0	3
Redwater, Texas Fever, or Tick Disease	0	3
*Roodwater, Miltziekte and Quarter-Evil .. .. each	0	3
*Rinderpest Investigations at Kimberley, Reports of Prof. Koch's, dated 11th and 12th March, 1897 ... ... each	0	3
*Rinderpest Investigations at Kimberley, Reports of Dr. Kohlstock's, dated 17th May, 1897 each	0	3
*Rinderpest in South Africa each	0	3
Rinderpest, Inoculation against (English and Dutch combined)...	0	3
Runderpest	0	3
*Scab: Its nature, cause, symptoms and treatment ... ... each	0	3
Schapen, Malarische, Catarrhale Koorts van	0	3
*Sheep, Fluke or Slak in the Liver of ... ...each	0	3
*Sheep and Wool ... ... each	0	3
*Stock, Diseases of, Griqualand West, Report on, 1884 ... each	1	0
*Stock, Poisoning of ... ... each	0	3
*Styfziekte and Lamziekte or Osteo-malaria and Paralysis each	0	3
Swine Fever, Hog Cholera, or Pig Typhoid	0	3
Ticks and African Coast Fever...	0	3
*Tuberculosis and the use of Tuberculin ... ... each	0	3
Varkenskoorts	0	3
*Wire-worm (Strongylus Contortus): The Stomach Worm of Sheep and Goats ... ... each	0	3
*Worms in Domestic Animals: Treatment of ... ... each	0	3

	Price. s. d.
Viticulture.	
*American Vines by Baron von Babo, Grafting of ... ... each	0 3
*Dry Wines in Hot Countries, Manufacture of ... . each	0 6
*Fruit Culture, Report on the Prospects offered by the Gamtoos River Valley ... ... each	0 3
*Hanepoot Grafts on American Vines, Report on Failure of each	0 6
*Phylloxerised Vineyards, The Reconstitution with special reference to the American Vine both as Graft Bearer and Direct Producer each	0 6
Vine Culture as exemplified at the Paris Exhibition	0 3
Viticulture and Wine Making (Agricultural Miscellanea: Part VIII.)	0 6
*Wine Casks: How to treat them each	0 3
Wine Making: Further Notes on	0 3
Wine Making and its bye-products Brandy and Vinegar: The making of	0 6
Miscellaneous.	
Altitudes above Sea Level, South Africa, 1886 (Gamble)	1 0
Arsenate of Lead	0 3
Blepharis Capensis	0 3
Coal Mines: Rules and Regulations for the Working of	0 3
Diamond Mines: Rules and Regulations for the Working of	0 3
Fertility of some Colonial Soils as influenced by Geological Conditions	0 3
Game Seasons, 1909	0 6
Game in Cape Colony, Preservation of	0 3
Land Laws of Cape Colony	0 3
*Marine and Inland Fishery Regulations, 1906 ... . each	0 3
*Mining Laws, Information regarding .. .. each	1 0
Monsonia, het Kaapsche Geneesmiddel Tegen Dysenterie	0 3
New Industry for Cape Farmers (Agricultural Miscellanea, Part XIII.)	0 6
Ocean and its Resources	0 3
Onderaardsche Watervoorraad van de Kolonie Kaap de Goede Hoop	0 3
*Poultry in South Africa ... each	0 3
Poultry Keeping in South Africa	0 3
Rainfall in South Africa ... each	0 3
*Stud Book, South Africa ... each	0 3
Trout, Protection of	0 3
Trout and Carp breeding and stocking of Streams	0 3
Transvaal Plant Import Regulations	0 3
Visch door middel van Rooken, Methoden voor het Bewaren van	0 3
Zuivel en zijne Opbrengst, Nota's en Aanteekeningen gecompileerd door D. Hutcheon	0 3

CURRENT MARKET RATES (WHOLESALE) OF AGRICULTURAL PRODUCE.

The following Table of Current Market Rates (Wholesale) of Agricultural Produce on Saturday, the 27th November, 1909, ruling at the several centres named, is published for general information.

Centre.	A. Wheat per 100 lbs.	B. Wheat Flour per 100 lbs.	C. Boer Meal per 100 lbs.	D. Mealies per 100 lbs.	E. Mealie Meal per 100 lbs.	F. Barley per 100 lbs.	G. Oats per 100 lbs.	H. Oat-hay per 100 lbs.	J. Lucerne Hay. per 100 lbs.	K. Potatoes per 100 lbs.	L. Tobacco (Boer Roll) per lb.	M. Beef per lb.	N. Mutton per lb.	O. Fresh Butter per lb.	P. Eggs per doz.	Q. Cattle (Slaughter)	R. Sheep (Slaughter)
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		
Aliwal North ..	0 12 6	1 1 6	0 13 9	0 5 9	0 7 6	0 8 6	0 10 0	0 5 0	0 3 0	0 12 6	0 1 0	0 0 6	0 0 4	0 1 3	0 1 3	£10	15/-
Beaufort West	0 10 0	0 18 0	0 14 0	0 6 3	0 8 0	0 9 6	0 6 4	0 5 0	0 5 0	0 8 0	0 0 8	0 0 2	0 0 3	0 1 6	0 0 9	£9	12/-
Burghersdorp	..	0 18 6	0 16 3	0 6 0	0 7 9	0 7 6	0 10 0	0 3 6	..	0 7 0	.	0 0 8	0 0 4	0 1 4	0 0 10	..	..
Cape Town ..	..	..	..	..	..	0 7 0	0 5 0	0 4 6	0 5 3	0 5 0	..	..	.	0 1 3	0 1 3	..	..
Clanwilliam ..	11/3 to 12/-	..	12/- to 13/-	0 7 0	..	..	0 5 0	..	..	0 6 0	0 6 [illegible]	4d. to 5d.	3d. to 5d.	0 1 0	0 0 9	.	..
Colesberg ..	..	..	..	..	..	..	..	0 5 6	..	..	..	0 0 4	0 0 3	0 1 9	0 1 4	..	..
Cradock ..	..	..	..	0 5 9	..	..	..	0 4 6	0 4 0	0 8 0	0 0 9	..	0 0 4	0 1 6	0 1 0	..	..
Dordrecht ..	0 11 6	1 0 0	0 16 0	0 6 3	0 8 3	0 8 0	0 8 0	0 5 0	0 6 0	0 10 0	0 1 0	0 0 3	0 0 4	0 1 0	0 0 9	£9	13/6
East London ..	0 9 0	0 18 0	0 15 0	0 5 6	0 13 6	0 5 0	0 5 6	0 5 0	0 6 0	0 13 6	0 1 0	0 0 4	0 0 4½	0 1 7	0 1 3	£10	19/-
Graaff-Reinet	0 12 0	..	..	0 7 0	..	0 6 0	..	0 4 0	0 2 0	0 12 0	..	0 0 4	0 0 4	0 1 9	0 1 3	£7	..
Grahamstown	0 11 0	..	..	0 6 0	..	0 6 3	0 6 9	0 4 6	..	0 7 6	0 0 4½	0 0 5	0 0 5	0 1 9	0 1 3½	..	..
Kimberley ..	0 12 3	0 17 9	0 15 3	0 4 6	0 6 8	0 7 0	0 6 11	0 5 9	0 4 10	0 8 0	0 0 5½	0 0 8	0 0 5	0 1 5	..	£7 15s.	11/3
King William's Town ..	0 10 9	0 18 0	0 15 0	0 6 0	0 7 0	0 6 0	0 7 6	0 4 6	0 4 0	0 12 0	0 0 5½	0 0 4½	0 0 4½	0 1 9	0 1 0	£11 10s.	15/-
Malmesbury ..	0 10 6	0 14 6	0 12 9	0 8 0	..	0 6 0	0 4 6	0 3 0	..	0 7 0	0 1 0	0 0 6	0 0 5	0 1 2	0 1 0	£12	14/- to 15/-
Mossel Bay ..	0 12 0	0 18 9	0 15 6	0 6 0	..	0 6 0	..	0 5 0	..	0 5 6	0 0 4	0 0 5		..	0 0 9	..	..
Port Alfred ..	0 13 0	0 19 6	0 19 0	0 7 0	0 10 0	0 6 0	0 8 0	0 3 0	..	0 6 0	0 0 6	0 0 5	0 0 5	0 1 3	0 0 9	£15	20/-
Port Elizabeth	0 11 6	..	..	0 6 0	..	0 5 0	0 5 6	0 3 6	..	0 11 6	..	0 0 6	0 0 8	0 1 6	0 1 3	..	..
Queenstown ..	..	..	0 14 0	0 5 0	0 12 6	0 8 0	0 8 0	0 4 0	0 10 0	0 12 0	0 0 5	0 0 6	0 0 5	0 1 4	..	..	..
Tarkastad ..	0 12 0	1 2 0	0 15 6	0 6 0	0 13 0	0 7 0	0 4 6	0 4 6	0 4 0	0 12 6	0 1 0	0 0 4	0 0 4	0 1 3	0 1 0	£7	15/-
Vryburg ..	0 15 0	1 0 0	0 12 6	0 4 0	0 6 6	0 9 0	0 10 0	0 7 0	0 5 6	0 12 0	0 0 4	0 0 8	5d. to 7d.	0 1 3	0 1 0	£8 to £10	9/- to 12/-
Worcester ..	0 11 9	0 16 0	0 12 6	0 7 6	0 8 6	0 7 0	0 5 8	0 2 10	0 4 6	0 5 0	0 0 5	3d to 6d.	0 0 3	0 1 3	0 1 10	£6 10s to £12	12/6 to 14/-

PRODUCE MARKETS.

CAPE TOWN.

R Müller (Produce Department), reports for the month ending November 30 :—

Ostrich Feathers.—The turnover has been satisfactory, both as to quantities and qualities. Strong demand exists for good quality of almost every class of feathers.

	£	s.	d.	£	s.	d.
Super Primes ...	19	0	0	35	0	0
First, ordinary to Seconds ...	11	5	0	17	10	0
Seconds	7	10	0	9	10	0
Thirds	3	0	0	5	10	0
Femina Super ...	9	10	0	16	0	0
Do., Seconds to Firsts ...		10	0	11	0	0
Byocks (Fancy) ...	4	5	0	9	10	0
Long Blacks ...	2	15	0	6	10	0
Medium Blacks ...	1	10	0	3	10	0
Short to Medium ...	0	10	0	1	5	0

	£	s.	d.	£	s.	d.
Floss	0	7	6	1	10	0
Long Drabs	2	5	0	4	0	0
Medium Drabs ...	0	15	0	1	10	0
Short to Medium ...	0	5	0	0	15	0
Floss	0	5	0	1	10	0
White Tails	1	2	6	2	2	6
Coloured Tails ...	0	12	6	2	5	0
Chicks...	0	1	0	0	2	6
Spadonas	0	10	0	1	15	0
Inferior Black and Drabs, short to long	0	0	6	1	10	0

Wool.—Large parcels have been offered for sale here, and are still arriving freely, selling readily at good prices. The competition is sound, and the following are the prices which have been realised recently for wools of the various districts, viz. : Karoo, 7½d. ; Calvinia, 6¾d. ; Ceres, 8¾d. ; Roggeveld, 8¾d. ; Caledon, 9d.

	s.	d.	s.	d.
Super long Grass Veld ...	0	6	0	9
Do. Karoo	0	6	0	7½
Medium	0	5	0	6½
Short and inferior	0	3	0	4½
Wool for Washing	0	4½	0	6½
Snow-white Super to Extra	1	4	1	8
Do. Ordinary ...	1	2	1	4
Fleece Washed	0	0	0	10

Mohair.—The market remains very weak. Fortunately no quantities are being offered for sale. For superior qualities there is a demand, but medium and inferior sorts are neglected.

	s.	d.	s.	d.
Firsts, Summer	0	7	1	1
Kids	1	6	1	9
Seconds ...	0	5½	0	9
Winter .	0	8½	0	9½
Do. Kids..	0	11	1	2½

Hides and Skins.—The market keeps strong. High prices are still being paid for all good qualities skins and hides. Consignments from the country should be made with the least possible delay in order to gain advantage of the high prices still ruling.

	s.	d.	s.	d.
Long woolled Skins	0	5½	0	6½
Short...	0	4	0	4½
Shorn	0	0	0	3
Bastards	0	3½	0	4
Cape Skins, each ...	2	2	2	8
Do., out, each	0	0	1	1
Goat, heavy to light ...	0	10½	1	2½
Sundried	0	0	0	6
Angoras	0	4	0	6
Sundried Hides	0	6½	0	7½
Salted	0	5½	0	7
Wet...	0	3½	0	4½

PORT ELIZABETH.

Messrs. J. Daverin & Co. report under date November 26 —

Ostrich Feathers.—The market was again fully supplied this week with a fair assortment. On Monday and Tuesday prices were steady, but on Wednesday the tone of the market was decidedly weaker for ordinary average Whites and Feminas, and prices showed a downward tendency. The total quantity sold on the market amounted to £17,793 9s. 10d., and weighed 7,771 lbs.

		£	s.	d.		£	s.	d.
Primes: Extra Super		Special Prices.						
Good to Super	...	20	0	0	to	35	0	0
Whites: Firsts	...	12	0	0	„	18	0	0
Seconds	...	4	0	0	„	10	0	0
Thirds	...	1	0	0	„	4	10	0
Feminas: Super	...	10	0	0	„	20	0	0
Firsts	...	6	10	0	„	10	10	0
Seconds	...	2	10	0	„	6	0	0
Thirds	...	0	10	0	„	2	10	0
Greys	...	1	10	0	„	7	0	0
Fancy ...	...	2	10	0	„	8	0	0
Tails: White ...	...	0	10	0	„	2	10	0
Light ...	...	0	10	0	„	2	10	0
Coloured & Dark		0	0	6	„	0	15	0

		£	s.	d.		£	s.	d.
Blacks: Long	...	2	0	0	to	6	10	0
Medium	...	1	0	0	„	3	0	0
Short	...	0	4	0	„	1	0	0
Wirey	...	0	0	3	„	0	0	6
Floss	...	0	4	0	„	1	0	0
Drabs: Long...	...	0	15	0	„	3	15	0
Medium	...	0	10	0	„	1	10	0
Short ..	...	0	1	6	„	0	7	6
Wirey	...	0	0	3	„	0	0	6
Floss...	...	0	4	0	„	1	2	6
Spadonas: Light	...	0	5	0	„	4	10	0
Dark	...	0	2	6	„	2	0	0
Chicks ..	...	0	0	6	„	0	12	6

The following may be quoted as the approximate current values of unsorted parcels, per line :

	Whites.	Feminas.
Superior pluckings	£8 0 0 to £10 0 0	£5 10 0 to £7 10 0
Good Average lots	6 0 0 to 7 10 0	4 0 0 to 5 0 0
Poor Average lots	4 0 0 to 5 0 0	2 0 0 to 2 10 0
Common lots, stalky, narrow and discoloured	2 0 0 to 3 10 0	0 15 0 to 1 15 0

	Tails.	Blacks.	Drabs.	Spadonas.
	s. d. s. d.	s. d. s. d.	s. d. s. d.	s. d. s. d
Good ...	12 6 to 17 6	20 0 to 40 0	12 6 to 15 0	30 0 to 40 0
Average ...	7 6 to 10 0	12 6 to 17 6	7 6 to 10 0	10 0 to 20 0
Poor ...	3 6 to 6 6	7 6 to 10 0	5 0 to 7 6	2 6 to 7 6

It will be understood that for special lots, these quotations may be exceeded.

Wool.—The London Sales opened on Tuesday, and our cable reported that prices showed no change. Our market maintains a cheerful tone, and a fair amount of business has been done in the open market during the week, of which our sales of 1,250 bales were the most important. On the catalogue sales on Wednesday 3,786 bales were offered, of which 1,273 bales were sold. Competition was active for all well-conditioned lots at full prices, but heavy and wasty parcels were neglected, and little notice was taken of them. On yesterday's Public Market a large quantity was offered, being for the most part oddments and C & C wool, for which prices showed no change.

Snowwhite, Extra Superior	...20d	to	20½d
Do. Superior ...	...17½d	„	19d
Do. Good to Superior...	16½d	„	17d
Do. Inferior Faulty	...13½d	„	14½d
Grease, Super Long, well-conditioned, Grassveld grown (special clips)	... 8½d	„	10d
Do. do. do. ...	7½d	„	8d
Do. do. Karoo grown (special clips)	7¾d	„	8¼d
Do. do. do. ...	6¾d		7¼d
Do. do. Mixed Veldt...	7d	„	7¼d
Do. Light, faultless, medium Grassveldt grown	... 6½d	„	7¼d
Do. do. Karoo grown	6¾d	„	7½d
Do. do. short, do.	6d	„	6½d

Grease, Coarse and Coloured ...	1½d	to	4d
Scoured do. do. ...	1½d	„	8½d
Basuto Grease, short	6d	„	6½d
O.R.C. Grassveld Grease, long & well-conditioned (special clips)	7¼d	„	8d
Do. do. do. ...	6½d	„	7d
Do. do. medium grown, light, with little fault	6d	„	6½d
Do. do. short, faulty & wasty	4¾d	„	5½d
Do. do. Karoo grown, long & well-conditioned ...	6½d	„	7¼d
Do. do. medium grown, light with little fault ...	6d	„	6½d
Do. do. short, faulty and wasty...	4½d	„	5½d

Mohair.—This market continues very quiet, and little business has been done in the open market during the week, but we think this lull is only a temporary one, as the latest advices from the other side report spinners very busy, and future prospects very hopeful. On the Public Market on Tuesday a fairly large quantity was offered to a very weak market, and a large proportion of the offerings were declared not sold.

We quote the following as current prices of :—

Super Kids	None offering
Ordinary Kids and Stained ...	do.
Superior Firsts, special clips ...	12¼d to 12½d
Ordinary Firsts...	11½d ,, 12d
Short Firsts and Stained ...	10d ,, 10½d
Superfine Long Blue O.R.C. Hair	10½d ,, 13d

Mixed O.R.C. Hair (average)	8½d to 10½d
Do. very mixed ...	7d ,, 8d
Seconds and Grey	5d ,, 7½d
Thirds	4¼d ,, 4¾d
Winter Kids, special clips ...	15d ,, 15d
Do. good ordinary ...	13d ,, 14d
Winter Hair	9½d ,, 9¾d
Basuto Hair	8½d ,, 10d

Skins are steady, and Sheepskins we sold this week in bundles at 5⅝d., and Pelts at 4d. per lb.; Capes, 27d.; damaged, 7d. each; Goatskins, 13½d.; damaged, 7d. per lb., and Heavy Goatskins 8½d.; Angoras, 7⅝d.; Shorn, 5¼d.; damaged, 3½d. per lb.; Johannesburg Sheep, 5½d.; Goat, 8½d.; Angoras, 6d.; Springbok, 8½d. each.

Hides.—Sundried, 9d., damaged, 8d.; salted, 8d., damaged, 7d.; thirds, 3d.

Horns.—3½d. each all round.

EAST LONDON.

Messrs. Malcomess & Co., East London, report for the month ending November 30 :—

Wool.—Our market has been very firm during the past month, due to confidence being quickly restored after the sharp drop reported last month. High prices and a huge supply pending, are factors to bring values down; but as the trade in general is good, it would seem that manufacturers consider a 10 per cent. drop sufficient. The consequence is that demand broadened with restored confidence. Antwerp and London were expected to decline 5 to 10 per cent., but the strikes in Australia having delayed shipments from that quarter temporarily, both markets were strengthened, and have eased off only par to 5 per cent. The better tone in manufacturing centres has not only been reflected on this side, but even magnified; so much so that short wools are distinctly above parity of prices ruling to-day in London.

During the past month four public auctions have been held here as follows :—November 3, 4,700 bales offered, 2,500 bales sold; November 11, 4,500 bales offered, 3,000 bales sold; November 17, 4,500 bales offered, 3,000 bales sold; November 24, 4,500 bales offered, 2,500 bales sold. All good superior light, well-conditioned clips, commanded very full prices, but very heavy wasty wools, both long and short, were neglected.

The following rates were made :—7d.—7⅜d. for very lightest and best Transkei and K.W.T. local grease; 6½d.—6⅞d. for average Transkei and K.W.T. local grease; 6¼d.—6½d. for average to good Basuto native grease.

Super long light Kaffrarian Farmers Grease and similar well-conditioned Wools (special clips)	9¼d to 10¼d
Super short ditto	7½d ,, 8½d
Super long Light Skirted Farmers	7d to 9d
Super short ditto	6½d ,, 7½d

Good long well-conditioned Grass Veldt	6d to 7¼d
Good short ditto ditto ...	5½d ,, 6½d
Short, faulty and wasty... ...	5d ,, 5¾d
Long Fatty, faulty Grease ...	5d ,, 6d
Short ditto ditto	4d ,, 5d
Coarse and Coloured Grease ...	3d ,, 4d

Mohair is quiet and dull, but consumption is well maintained, and stocks in first hands are not large. There is no change to report, and we repeat our last quotations, viz. :—12½d. to 13d. for superior long Blue Mohair; 10½d. to 11d. for average long, little kempy; 10d. to 10½d. for average to superior Basuto Hair; 5d. to 6½d. for Seconds; 3½d. to 5d. for Dockings and Greys; 9½d. to 9¾d. for good average Winter hair; and 13d. to 14d. for genuine super. Winter Kids.

Sundry produce has ruled as follows :—Hides, sundried, 9½d.; dry, salted, 8½d.; Goatskins, 13½d.; Angora skins, 8½d.; damaged, 7d.; Sheepskins, 5½d.; pelts and coarse, 4¼d. and 4¾d.; Transkeian and King William's Town parcels, 4½d.; Horns, 2d. to 4d. each, according to size and quality.